PROJECT MANUAL

International Kia

8821 159th Street
Orland Hills, IL 60487

Prepared by

Simon Design Group

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Issue for Permit + Bid

May 10, 2017
Project Number 1705

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SECTION 00 41 00 – BID FORM

PART 1 - GENERAL

1.1 The Bid Form is included in these Specifications. Bidder shall fully execute the Bid Form, fill in all blanks and attach all required documentation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 00 41 00
Custom/11-01/bac

PROJECT IDENTIFICATION: **International Kia**

BID TO ("OWNER"): **International Auto Orland Park**
8031 W. 159th Street
Tinley Park, IL 60477

BID FROM ("BIDDER"): _____**<Contractor's Name>**
_____**<Contractor's Address>**
_____**<Contractor's Address>**

1. The undersigned BIDDER agrees, if this Bid is accepted, to enter into an agreement with OWNER ("Agreement"), in the form included in the Bidding Documents, to perform and furnish the Work as specified or indicated in the Bidding Documents for the Bid Price and within the Bid Times indicated in the Bidding Documents and in accordance with the other terms and conditions of the Contract Documents.

2. In submitting this Bid, BIDDER represents that:

   a. This Bid will remain subject to acceptance for 30 days after the day of Bid opening;
   b. The OWNER has the right to reject this Bid;
   c. BIDDER accepts the provisions of the Instructions and Supplementary Instructions to Bidders regarding disposition of Bid Security (if required);
   d. BIDDER will sign and submit the Agreement with the bonds and other documents required by the Bidding Requirements within 15 days after the date of OWNER'S Notice of Award;
   e. BIDDER has examined copies of all the Bidding Documents;
   f. BIDDER has visited the site and become familiar with the general, local, and site conditions;
   g. BIDDER is familiar with federal, state, and local laws and regulations;
   h. BIDDER has correlated the information known to BIDDER, information and observations obtained from visits to the site, reports and drawings identified in the Bidding Documents, and additional examinations, investigations, explorations, tests, studies and data with the Bidding Documents.
   i. This Bid is genuine and not made in the interest of or on behalf of an undisclosed person, firm or corporation; BIDDER has not directly or indirectly induced or solicited another Bidder to submit a false or sham Bid; BIDDER has not solicited or induced a person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself an advantage over another BIDDER or over OWNER.
   j. BIDDER has received the following Addenda, receipt of which is hereby acknowledged (Bidder: Add rows as necessary to include all Addenda):

Date	Number
_____	_____
_____	_____
_____	_____
_____	_____

3. BIDDER will complete the Work in accordance with the Contract Documents for the following price(s):

   STIPULATED-SUM BID PRICE

   (Use Words) _____

   (Use Figures) ($_____)

4. ALTERNATES

5. UNIT PRICES

6. BIDDER agrees that the Work will be substantially complete and ready for final payment in accordance with the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

7. The following documents are attached to and made a condition of this Bid:

   a. Required BIDDER's Qualification Statement with supporting data.

SUBMITTED on _____, 20___.

By: _____
(firm name)

_____
(name of person authorized to enter into contracts)

Business Address: _____

_____

_____

Phone: _____

Fax: _____

Trade Cost Breakdown

(minimum breakdown, attached additional support data if needed)

1. _____ Sitework
2. _____ Structural Excavation
3. _____ Cast in place Concrete
4. _____ Masonry
5. _____ Misc. Rough Masonry
6. _____ Interior Arch. Woodwork
7. _____ Metal Fabrications
8. _____ Joint Systems & Firestopping
9. _____ Doors, Frames, & Hardware
10. _____ Overhead Doors
11. _____ Interior Drywall
12. _____ Interior Ceiling finishes
13. _____ Painting
14. _____ Glazed Alum. Curtainwall & Windows
15. _____ Fire protection specialties
16. _____ Access Doors and Frames
17. _____ Toilet Room Accessories
18. _____ Signage
19. _____ Walk-off Mat
20. _____ Panty Appliances
21. _____ Fire Protection
22. _____ Mechanical
23. _____ Electrical
24. _____ Plumbing
25. _____ General Conditions
26. _____ Insurance
27. _____ Building Permit Fees
28. _____ Overhead & Profit

_____ **TOTAL COST**

Additional Bid Information

A. Bid is Due per instructions on this email address
B. On cover of the Bid, Provide Bids broken out as per the attached document
C. Provide construction schedule. Assume anticipated start date to be July 01, 2017. There may be a few weeks of delay due to city variance issues. Owner would like to stay in operations if possible.
D. Alternates will be the following items:
    1. Alternate#1: Provide Trench Drain at Service Drive, replace existing triple basin
    2. Alternate#2: Replace Trench Drain, provide venting to be code compliant, patch concrete around drain
    3. Alternate#3: provide number to preplace roof over shop with PTO and R-30

SECTION 01 1000 – SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section addresses:
1. Work covered by Contract Documents.
2. Contracts.
3. Special insurance.
4. Work sequence.
5. Use of premises.
6. Work by others under other contracts.
7. Future work.
8. Products ordered in advance.
9. Owner furnished products.
10. Specifications format.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to all Sections. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all.

B. Conflicts or discrepancies among the Contract Documents shall be resolved in the following order of priority:
1. Amendments and revisions (such as Change Orders) of later date take precedence over those of earlier date;
2. the Agreement;
3. the Supplementary Conditions;
4. The General Conditions;
5. Drawings and Specifications; Drawings govern Specifications for quantity and location. Specifications govern Drawings for quality and performance. In the event of ambiguity or conflicts, the greater quantity and the better quality shall govern.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: International Auto KIA

B. Simon-Arch Project Number: 1405
1. Project Location:
8821 W. 159th Street
Orland Hills, IL

C. Architect Identification: Simon Design Group

500 Lake Cook Road, Suite 350
Deerfield, IL 60015

D. General Contractor: TBD

E. The Work includes site development and new automotive dealership

1.4 CONTRACT

A. Project will be constructed under a single prime contract.

1.5 SPECIAL INSURANCE

A. Contractor's Commercial General Liability insurance shall contain no exclusion that would deny coverage for any claim arising out of or contributed to by any fungus, mildew, mold, or resulting allergens. If such exclusion exists and cannot be removed by endorsement, Contractor shall submit proof of coverage for fungus, mildew, mold, or resulting allergens under a Pollution Legal Liability or Contractor's Pollution Liability policy.

1.6 WORK SEQUENCE

A. The Work shall be conducted in phases. Coordinate construction schedule and operations with the Owner and Architect**.**

1.7 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
   2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
   3. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

END OF SECTION 01 1000
011000/12-03/drh

SECTION 01 1400 – WORK RESTRICTIONS

PART 1 - GENERAL

1.1 USE OF PREMISES

A. Nonsmoking Building: Smoking is not permitted within the building or within 30 feet of entrances, operable windows, or outdoor air intakes.

B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.
   1. Limits: Confine constructions operations to exterior facade. Coordinate with Phase schedule.
   2. Owner Occupancy: Allow for Owner occupancy of building and use by the public.
   3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize use of driveways and entrances.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period

1.2 OCCUPANCY REQUIREMENTS DURING CONSTRUCTION

A. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations.
   1. Schedule use of premises for Work and coordinate construction operations with the Owner to allow for Owner occupancy.
   2. Schedule use of premises for Work and coordinate construction operations with the Owner to allow for use of site and premises by the public.
   3. Perform the Work during normal business hours only upon approval of the Owner and with the consent of Building Management.
   4. Perform demolition work after business hours or at such times as approved by the Owner.
   5. Keep premises orderly, clean and with a minimum of obstruction and inconvenience to the tenants and the public.
   6. Limit use of site to areas designated unless otherwise allowed by Owner in writing.
   7. Relocate any stored products that interfere with public access, operations of the Owner or separate contractor. If necessary, obtain and pay for additional storage or work areas needed for operations.

1.3 OCUPANCY REQUIREMENTS PRIOR TO SUBSTANTIAL COMPLETION

A. Partial Owner Occupancy: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
   1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
   2. Contractor shall obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
   3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will provide, operate, and maintain mechanical and electrical systems serving occupied portions of building.
   4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 1400
01140/9-98/bac

SECTION 012200

UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Sections:

1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Division 01 Section "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

1.	Furnish, place, and install (2.25”) asphalt pavement binder	$_____/SY
2.	Furnish, place, and install (2.00”) surface course	$_____/SY
3.	Furnish, place, and install (1.75”) surface course	$_____/SY
4.	Excavate and legally dispose excess material off-site	$_____/c.y.
5.	Excavate and remove to on site location unsuitable soils and replace with CA-1 limestone compacted.	$_____/c.y.
6.	Aggregate base CA-6 brought to site, placed and compacted	$_____/c.y.
7.	Undercut excavate and legally dispose excess material off-site, import suitable material and compact it to required compaction rate	$_____/c.y.
8.	B6.12 Concrete curb	$_____/l.f.
9.	Pavement removal	$_____/SY
10.	5” concrete sidewalk	$_____/SY
11.	6" topsoil furnish and place, IDOT Cl 3 seeding (at 3,000 lbs/acre), and erosion control blanket	$_____/SY
12.	12” R.C.P. pipe	$_____/LF
13.	24” R.C.P. pipe	$_____/LF
14.	60” R.C.P. pipe	$_____/LF
15.	48” precast concrete catch basin	$_____/EA
16.	84” precast concrete catch basin	$_____/EA
17.	6” P.V.C. pipe	$_____/LF

The following per unit prices for operation and equipment on a straight time basis for all equipment anticipated to be used to perform the work of this contract.

Item Description		Unit Value
A.	_____	$_____/hr
B.	_____	$_____/hr
C.	_____	$_____/hr

END OF SECTION 012200

SECTION 01 26 00 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:
   1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue through Skender Construction supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on the Bulletin form included at end of Part 3.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Within 5 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to the General Contractor.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
5. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use “Bulletin”, selecting ‘Architect’s Request for Contractor’s Proposal’.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request. Architect will issue a Change Order for signatures of Owner and Contractor on "Change Order” form included at end of Part 3.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00
01250/9-98/bac

SECTION 01 26 13 – REQUESTS FOR INTERPRETATION (RFI'S)

PART 1 - GENERAL

1.1 REQUEST(S) FOR INTERPRETATION (RFI'S)

A. General: A Request for Interpretation (RFI) is a Contractor initiated, Architect formatted, written instrument related to the execution of the Work that is addressed to the Architect. The RFI shall be used by the Contractor as the means to ask questions related to the Work; subject to the conditions contained within this article.
   1. An RFI which fails to conform to the requirements stated herein, (for example, is incomplete or contains numerous errors) shall be returned to the Contractor for its completion/rectification without benefit of the Architect's response, in addition, no adjustments for Contract Time or Contract Sum shall be granted for an RFI failing to conform to the requirements stated herein.
   2. The Owner reserves the right to assess the Contractor for the cost (based on time and materials) of an RFI response performed by the Architect, and any of it's consultants, which is deemed by the Owner and the Architect as being frivolous or unnecessary (for example, the subject of the RFI is addressed in the Contract Documents). Such RFI's shall be removed from the RFI log.
   3. Each RFI shall be submitted with such promptness as to cause no delay in the Contractor's own work and in that of any subcontractor. No adjustments of Contract Time or Contract Sum will be granted because of failure to have an RFI submitted with sufficient time to allow for the orderly processing of a response by the Architect.

B. Authorship:
   1. Prior to the commencement of the RFI process, the Contractor shall designate a full time "RFI Manager" whose duties shall include the responsibility for enforcing the Request for Interpretation provisions of this article, to maintain an up-to-date log of all RFI's, advise the Architect, in writing, of the status and disposition of all RFI's at the progress meetings, and be a member of the Contractor's staff. The RFI Manager shall be experienced in administration and supervision of building construction of the type indicated on the contract documents including mechanical and electrical work.
   2. Each RFI shall originate solely from the Contractor's RFI Manager. An RFI submitted to the Architect by an entity, or individual, other than the RFI Manager shall be returned to the Contractor.

C. Prohibitions: RFI's shall not be used for the following:
   1. To solicit consideration by the Architect of a "substitution."
   2. To request an adjustment of the Contract time. If the Contractor believes that the response received from the Architect to any RFI warrants adjustment to the Contract time it shall immediately advise the Architect, in writing, upon receipt of the Architect's response.
   3. To request an adjustment of the Contract sum. If the Contractor believes that the response received from the Architect to any RFI warrants adjustment of the Contract sum it shall immediately advise the Architect, in writing, upon receipt of the Architect's response.
   4. To solicit comment clarification(s) of any required submittal or shop drawing review that was transmitted by the Architect to the Contractor.

5. RFI's shall not be used to transfer coordination responsibility from the Contractor to the Owner or the Architect.

D. Procedure:
1. The Contractor shall submit all RFI's on the form supplied by the Architect.
2. Each blank on the RFI form shall be filled in.
3. Each RFI shall be typewritten and shall be forwarded to the Architect in triplicate. Each RFI shall address one subject.
4. Each RFI shall contain specific reference to the drawing number(s), detail number(s), schedule type(s), bulletin number(s), specification section(s) and paragraph number(s), or other related document(s) which is (are) pertinent to the Contractor's question. The date of each referenced drawing number, bulletin, specification section or other related document shall be identified. In preparing each RFI verify the applicable dimension(s), field conditions, drawing requirements (small through large scale details), and/or specification section requirements pertaining thereto. Prior to submission of the RFI coordinate the nature of the inquiry with the requirements of other sections or trades as related thereto and responses to previous RFI's. Where supplementary sketches are required to clarify an inquiry the Contractor shall attach supplementary sketches, at large scale, illustrative of the inquiry. Sketches shall include sufficient detail, materials, dimensions, thicknesses, assembly, attachments, relation to adjoining work, structural grid references, and all other pertinent data and information for the Architect to make an informed response.
   a. The Contractor is encouraged to suggest solution(s) to its inquiries, if applicable. Should the Contractor's solution(s) have an impact on Contract Sum or Contract time it shall be so stated within the RFI.
5. Each RFI shall be dated and sequentially numbered.
6. Each RFI shall be reviewed, and signed, by the RFI Manager prior to transmitting to the Architect.
7. Duration of RFI Response Upon Receipt: 5 business days.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 13
01100/9-98/ttt

REQUEST FOR INTERPRETATION

DATE: _____ RFI No.: _____

TO: Simon Design Group
500 Lake Cook Road, Suite 350
Deerfield, Illinois 60015

or EM to design@simon-arch.com

RE: _____ Project No.: _____
(Project Name) (Architect Project Number)

FROM: _____ Project No.: _____
(Contractor) (Contractor Project Number)

_____ Subcontractor: _____
(Address)

_____ Subcontractor RFI No.: _____

_____ Date Received by Contractor: _____

DESCRIPTION

Subject: _____

Drawing and Detail No./Date: _____

Schedule Title: _____

Contract Change: _____ Specification No./Date: _____

Bulletin No. Date: _____ Paragraph No.: _____

Other/Date: _____ Enclosures: _____

Description of Problem or Requested Information and Proposed Solution (if any):

By: _____ Response Requested By: _____
(RFI Manager)

SECTION 01 2900 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 DEFINITIONS

A. (Field) Review: Architect's visits to the site at intervals necessary in the judgment of Architect to become generally familiar with the progress and quality of the Work completed and to determine in general if the Work completed is in accordance with the Contract Documents. Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with Continuation Sheets.
      b. Submittals Schedule.
      c. Contractor's Construction Schedule.
   2. Submit the Schedule of Values at earliest possible date but before the date scheduled for submittal of initial Applications for Payment.
   3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the Schedule of Values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
      a. Related Specification Section or Division.
      b. Description of the Work.
      c. Name of subcontractor.
      d. Name of manufacturer or fabricator.
      e. Name of supplier.

f. Change Orders (numbers) that affect value.
g. Dollar value.
1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
a. Break down principal subcontract amounts into separate labor and materials items. Breakdown of subcontractor's schedule of values must be true and accurate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified and paid for by Owner.
1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Review:
1. Prior to the 25th day of each month, furnish the Architect with a draft (pencil) copy of the Application for Payment.
2. On the 25th day of each month, the Owner, the Architect and the Contractor shall meet to review the draft (pencil) copy of the application and Certificate for payment. Questions resulting from this review shall be answered by the Contractor and clarified prior to receipt of the final copy of the Application and Certificate for Payment that is to be submitted to the Architect on the 1st day of the following month.
3. Upon receipt of the final Application and Certificate for Payment and other documentation as required by the Architect including the updated Schedule of Values and the updated Construction Schedule, the Architect shall review the documents received to determine if they correspond to the agreements reached during the draft (pencil) copy review. Upon completion of the Architect's review, the Architect shall revise and execute the Applications and Certificate for Payment to correspond to the agreements reached and forward the executed copies to the Owner.

4. In taking action on the contractor's Application and Certificate for Payment, the Architect will rely on the accuracy and completeness of the information furnished by the contractor and will not be deemed to represent that he has made audits of the supporting data.
5. Payment will not be made for materials and equipment stored off the site, except at the Owner's discretion and prior approval. When the Application and Certificate for Payment includes material or equipment stored off-site, the Application shall be accompanied by a statement certifying:
   a. Description of the item(s) being stored.
   b. Location of the bonded warehouse(s) where materials or equipment is being stored.
   c. Affidavit of Storage.
   d. Certificate of Insurance.
   e. Bill of sale made to Owner stating there will be no additional cost for transportation and delivery of the item(s) being stored.
   f. Statement certifying that item or any part thereof will not be installed in any construction other than work under this Contract.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Incomplete applications will be returned without action.
1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders issued before last day of construction period covered by application.

E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit notarized waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
   a. Submit final Application for Payment with or proceeded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors, principal suppliers and fabricators.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Submittals Schedule (preliminary if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of building permits.
9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Report of preconstruction conference.
11. Certificates of insurance and insurance policies.
12. Data needed to acquire Owner's insurance coverage(s).
13. Performance and payment bonds.
14. Data needed to acquire Owner's insurance.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements, including, but not limited to:
   a. Transmittal of required Project Record Documents to Owner.
   b. Evidence of completion of demonstration and training.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims" and AIA Document G706A, "Contractor's Affidavit of Release of Liens."
5. AIA Document G707, "Consent of Surety to Final Payment."
6. Evidence that claims have been settled.
7. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
8. Final, liquidated damages settlement statement.
9. Occupancy permits and similar approvals or certifications by governing authorities and franchised services, assuring Owner's full access and use of completed work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 3100 – PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General project coordination procedures.
   2. Conservation,
   3. Coordination Drawings.
   4. Administrative and supervisory personnel.
   5. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

C. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 01 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
   2. Division 01 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Division 01 Section "Closeout Procedures" for coordinating Contract closeout.

1.2 COORDINATION

A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts

and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.

1.3 CONSERVATION

A. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
   1. Indicate relationship of components shown on separate Shop Drawings.
   2. Indicate required installation sequences.
   3. Refer to Divisions in the Facility Services Subgroup for specific Coordination Drawing requirements for mechanical and electrical installations.

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
   1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
   1. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.
4. Notification: Inform participants 3 days prior to meetings not regularly scheduled.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 10 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; testing laboratory representatives; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
    a. Requirements in individual Specification Sections for preconstruction responsibilities.
    b. Tentative construction schedule.
    c. Project coordination
    d. Phasing.
    e. Critical work sequencing.
    f. Designation of responsible personnel.
    g. Procedures for processing Requests for Information (RFI's.)
    h. Procedures for processing Bulletins.
    i. Procedures for processing submittals.
    j. Procedures for processing substitutions.
    k. Procedures for processing field decisions, proposal requests and Change Orders.
    l. Procedures for processing Applications for Payment.
    m. Distribution of the Contract Documents.
    n. Preparation of Record Documents.
    o. Use of the premises.
    p. Responsibility for temporary facilities and controls.
    q. Parking availability.
    r. Office, work, and storage areas.
    s. Equipment deliveries and priorities.
    t. First aid.
    u. Security.
    v. Progress cleaning.
    w. Working hours.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.

b. Options.
c. Related Change Orders.
d. Purchases.
e. Deliveries.
f. Submittals.
g. Review of mockups.
h. Possible conflicts.
i. Compatibility problems.
j. Time schedules.
k. Weather limitations.
l. Manufacturer's written recommendations.
m. Warranty requirements.
n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities and controls.
q. Space and access limitations.
r. Regulations of authorities having jurisdiction.
s. Testing and inspecting requirements.
t. Required performance results.
u. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements.
4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at regular intervals. Coordinate dates of meetings with preparation of payment requests. Schedule and administer special meetings as required.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
b. Review present and future needs of each entity present, including the following:
1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.

9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.
14) Documentation of information for payment requests.
15) Testing and inspection requirements.
16) Status of Request for Information.
17) Other business relating to the Work.

3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Coordination Meetings: Conduct Project coordination meetings At regular intervals corresponding to Work which needs to be coordinated. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
   1. Attendees: Every entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work
   2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
      a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
      c. Review present and future needs of each contractor present, including the following:
         1) Sequence of operations.
         2) Status of submittals.
         3) Deliveries.
         4) Off-site fabrication.
         5) Access.
         6) Site utilization.
         7) Temporary facilities and controls.
         8) Work hours.
         9) Hazards and risks.
         10) Progress cleaning.
         11) Quality and work standards.
         12) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3100
013100/05-05/drh

SECTION 01 3200 – CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Preliminary Construction Schedule.
   2. Contractor's Construction Schedule.
   3. Submittals Schedule.
   4. construction reports.
   5. Field condition reports.
   6. Special reports.
   7. Construction photographs.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
   2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

J. Action Submittal: Written and graphic information that requires Architect's responsive action. Submittals may be rejected for not complying with requirements.

K. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Submittals Schedule: Submit three printed copies of schedule . Arrange the following information in a tabular format:
1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

C. Preliminary Construction Schedule: Submit via e-mail.

D. Contractor's Construction Schedule: Submit via e-mail to show entire schedule for entire construction period.

E. Construction Photographs:
1. Digital Images: Submit a complete set of digital image electronic files as a Project Record Document.. Identify electronic media with date photographs were taken. Submit images that have the same aspect ratio as the sensor, uncropped.

F. Daily Construction Reports: Submit via e-mail copies at weekly intervals.

G. Material Location Reports: Submit via e-mail copies at weekly intervals.

H. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

I. Construction Waste Management Report: Submit two copies at monthly intervals.

J. Special Reports: Submit two copies at time of unusual event.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting.

B. Photographer Qualifications: An individual of established reputation who has been regularly engaged as a professional commercial photographer for not less than three years.

C. Pre-scheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, interim milestones and partial owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

D. Coordinate Contractor’s Construction Schedule with Owner’s Construction Schedule for Owner‘s own forces. Contractor shall make any revision to the Construction Schedule after a

joint review and mutual agreement. The Construction Schedule shall then constitute the Schedule to be used by Contractor, separate contractors and Owner until subsequently revised.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include the following information:
   1. Anticipated date of Architect's receipt of submittal.
   2. Number of business days allowed for Architect's review of submittal.
   3. Specification Section to which submittal relates.
   4. Subcontractor, fabricator or supplier responsible for preparing the submittal.
   5. Provide blank columns for actual date of submittal, re-submittal, and final-review status.
   6. Systems Submittals: Identify submittals for systems such as fire alarms, exterior walls, and curtain walls, on the transmittal and act upon the system singularly as a combined submittal.

B. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

C. Initial Submittal: Submit within 30 days of Owner's authorization to proceed with construction. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

D. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

E. Revisions: Notify Architect two weeks prior to any revisions to approved Final Submittal Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice of Award to date of Final Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
   2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule.

Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Include selection process activities for finishes and products specified by allowances or specified to be selected during the sample review process. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include not less than 10 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Demonstration and Training: Training of Owner's personnel as indicated in Division 01 Section "Closeout Procedures."

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Phasing: Arrange list of activities on schedule by phase.
   2. Work under More Than One Contract: Include a separate activity for each contract.
   3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
   4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
   5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
   6. Work Restrictions: Show the effect of the following items on the schedule:
      a. Coordination with existing construction.
      b. Limitations of continued occupancies.
      c. Uninterruptible services.
      d. Partial occupancy before Substantial Completion.
      e. Use of premises restrictions.
      f. Provisions for future construction.
      g. Seasonal variations.
      h. Environmental control.
   7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
      a. Subcontract awards.
      b. Submittals.
      c. Purchases.
      d. Mockups.
      e. Fabrication.
      f. Sample testing.
      g. Deliveries.
      h. Installation.
      i. Tests and inspections.
      j. Adjusting.
      k. Curing.
      l. Startup and placement into final use and operation.

8. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
   a. Structural completion.
   b. Permanent space enclosure.
   c. Completion of mechanical installation.
   d. Completion of electrical installation.
   e. Substantial Completion.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
   1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragments to demonstrate the effect of the proposed change on the overall project schedule.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within fifteen days of date established for commencement of work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 15 days of date established for commencement of work. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

C. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. List of separate contractors at Project site.
   3. Approximate count of personnel at Project site.
   4. High and low temperatures and general weather conditions.
   5. Accidents.
   6. Meetings and significant decisions.
   7. Unusual events (refer to special reports).
   8. Stoppages, delays, shortages, and losses.
   9. Meter readings and similar recordings.
   10. Emergency procedures.
   11. Orders and requests of authorities having jurisdiction.
   12. Change Orders received and implemented.
   13. Services connected and disconnected.
   14. Equipment or system tests and startups.
   15. Partial Completions and occupancies.
   16. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate Actual Completion percentage for each activity.
   4. Give Owner and Architect a minimum of one week's notice of all anticipated significant revisions to the project schedule.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. Provide Owner and Architect with an updated electronic version of the project schedule each month in CD-ROM format.
   2. Post electronic copies of the updated project schedule on the project website.
   3. Post copies in Project meeting rooms and temporary field offices.
   4. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.2 CONSTRUCTION PHOTOGRAPHS

A. Digital Images: Provide images in JPEG format, with minimum sensor size of 1.3 megapixels.

B. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties from different vantage points, as directed by Architect. Show existing conditions adjacent to property.

END OF SECTION 01 3200
01320/9-98/bac

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

B. Related Sections include the following:
   1. Division 01 Section "Payment Procedures" for submitting Applications for Payment.
   2. Delete first subparagraph below if Coordination Drawings are added to this Section.
   3. Division 01 Section "Project Management and Coordination" for submitting Coordination Drawings.
   4. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
   5. Division 01 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals.
   6. Division 01 Section "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
   1. Provide an executed Data Waiver form, at the end of this Section, from each subcontractor and sub-subcontractor or supplier.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Promptly submit Shop Drawings Product Data and Samples in accordance with the accepted schedule, as to cause no delay in the Work. Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.
1. Initial Review: Allow 10 business days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination. Delaying submittals to facilitate coordination between submittals shall not constitute a delay of the Work nor shall it be the basis for an extension of time.
2. Concurrent Review: Concurrent review is a submittal that requires review by more than one design discipline. Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, submittal schedule shall reflect concurrent review. Concurrent reviews are anticipated for, but not limited to, the following:
    a. Mechanical, Electrical, Plumbing, Fire Protection and Structural work .
3. Allow 10 business days for processing each resubmittal.
4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 5 inches by 6 inches on label or beside title block to record Architect's review markings.
3. Include the following information on label for processing and recording action taken:
    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name and address of Contractor.
    e. Name and address of subcontractor.
    f. Name and address of supplier.
    g. Name of manufacturer.
    h. Unique identifier, including revision number. Submittals shall be numbered consecutively and the numbering system shall be retained throughout all revisions.
    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Other necessary identification.

F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

G. Resubmission: Unless corrected copies are required for final submittal due to Architect's observance of noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
   1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
   2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.
   1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
   2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
   3. Transmittal Form: Provide locations on form for the following information:
      a. Project name and Architect's project number.
      b. Contractor's name and contractor's job number.
      c. Date.
      d. Destination (To:).
      e. Source (From:).
      f. Name of Contractor's personnel responsible for the review.
      g. Names of subcontractor, manufacturer, and supplier.
      h. Scheduled submittal date.
      i. Scheduled submittal return date.
      j. Category and type of submittal; Shop Drawing Product Data, Samples, Action Submittal, Informational Submittal.
      k. Submittal purpose and description.
      l. Submittal and transmittal distribution record.
      m. Contractor's remarks: explanation of exceptions and deviations from the Contract Documents.
      n. Signature of transmitter.

I. Transmittal Form: Execute the attached form with each submittal.

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

L. Substitution requests are not allowed in the form of submittals. Substitution requests must be made in accordance with Division 01 Section, "Product Requirements."

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.
   1. Number of Copies: Submit three copies of each submittal, unless otherwise indicated. Architect through Construction Manager will return two copies. Mark up and retain one returned copy as a Project Record Document.
   2. Number of Copies: Submit copies of each submittal, as follows, unless otherwise indicated:
      a. Initial Submittal: Submit a preliminary single copy of each submittal where selection of options, color, pattern, texture, or similar characteristics is required. Architect through Construction Manager will return submittal with options selected.
      b. Final Submittal: Submit three copies, unless copies are required for operation and maintenance manuals. Submit five copies where copies are required for operation and maintenance manuals. Architect, Construction Manager and when applicable Engineering Consultant will retain 1 copy each; remainder will be returned. Mark up and retain one returned copy as a Project Record Document.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Clearly mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's written recommendations.
      b. Manufacturer's product specifications.
      c. Manufacturer's installation instructions.
      d. Standard color charts.
      e. Manufacturer's catalog cuts.
      f. Wiring diagrams showing factory-installed wiring.
      g. Printed performance curves.
      h. Operational range diagrams.
      i. Mill reports.
      j. Standard product operating and maintenance manuals.
      k. Compliance with recognized trade association standards.
      l. Compliance with recognized testing agency standards.
      m. Application of testing agency labels and seals.
      n. Notation of coordination requirements.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not reproduce, digitally or otherwise, the Contract Documents and submit them as shop drawings. Contractor, subcontractors, suppliers and all other entities shall not use, copy or reproduce title blocks, dimensions, notes, keynotes, symbols schedules or details from Contract Drawings, digital or otherwise. Use of the Contract Drawings shall be limited to reproduction, digitally or otherwise, of the exterior wall layout, interior partition layout, grid lines, doors, and windows. Do not base Shop Drawings on standard printed data.

1. Preparation: Include the following information, as applicable:
   a. Dimensions.
   b. Identification of products.
   c. Fabrication and installation drawings.
   d. Roughing-in and setting diagrams.
   e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
   f. Shopwork manufacturing instructions.
   g. Templates and patterns.
   h. Schedules.
   i. Design calculations.
   j. Compliance with specified standards.
   k. Notation of coordination requirements.
   l. Notation of dimensions established by field measurement.
2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
4. Number of Copies: Submit copies of each submittal, as follows:
5. Submit all drawings electronically unless prints are required for operation and maintenance manuals. Submit five prints where prints are required for operation and maintenance manuals. Architect and Construction Manager will retain one print each; remainder will be returned.

D. Samples: Prepare physical units of materials or products, including the following:
1. Comply with requirements in Division 01 Section "Quality Requirements" for mockups.
2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
3. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
4. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
   a. Generic description of Sample.
   b. Product name or name of manufacturer.
   c. Sample source.
5. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
   a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of samples that show the range of variations.
   b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

6. Number of Samples for Initial Selection: Submit two full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect through Construction Manager will return submittal with options selected.
7. Number of Samples for Verification: Submit three sets of Samples. Architect and Construction Manager will retain one sample set each; remainder will be returned.
8. Systems Submittals: Identify submittals for systems such as fire alarms, exterior walls, and curtain walls, on the transmittal and act upon the system singularly as a combined submittal. If resubmission is required, resubmit entire system submittal.
9. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

E. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.

F. Delegated-Design Submittal: Comply with requirements in Division 01 Section "Quality Requirements."

G. Contractor's Construction Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for action required.

H. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."

I. Application for Payment: Comply with requirements in Division 01 Section "Payment Procedures."

J. Schedule of Values: Comply with requirements in Division 01 Section "Payment Procedures."

K. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

L. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Submit on the form attached at the end of this Section, "Subcontractors and Major Material Suppliers List."

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.
   1. Number of Copies: Submit three copies of each submittal, unless otherwise indicated. Architect will not return copies.
   2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   3. Test and Inspection Reports: Comply with requirements in Division 01 Section "Quality Requirements."

B. Contractor's Construction Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

J. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.

K. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

L. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

M. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

N. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction (Chicago Building Department), that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 01 Section "Closeout Procedures."

P. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

Q. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

R. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

S. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

T. Construction Photographs: Comply with requirements in Division 01 Section Photographic Documentation.

U. Material Safety Data Sheets: If requested by Owner, submit data sheets directly to Owner. Do not submit data sheets to Architect.
1. Architect will not review data sheets and will not return them to Contractor.

V. Daily Construction Reports: Comply with requirements in Division 01 Section "Construction Progress Documentation."

W. Certified Surveys: Comply with requirements in Division 01 Section "Execution Requirements."

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, coordinated, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S AND CONSTRUCTION MANAGER'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each properly executed submittal, make marks to indicate corrections or modifications required, and return it. Architect will reject and return submittals not complying with requirements. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
1. No Exceptions Taken. No further review of Submittal required.
2. Make Corrections as Noted. Incorporate corrections in Work; resubmittal is not required. If Contractor cannot comply with corrections as noted, revise to respond to exceptions and resubmit.
3. Revise as Noted and Resubmit. Revise as noted & resubmit for further review.

4. Resubmit Properly. Submittal not reviewed because it does not contain Contractor's signature indicating its review and approval, and/or is not in proper condition for review. Resubmit.
5. Not Reviewed. Submittal is not required by Contract Documents.
6. Received for Client's Record Only. Submittal not reviewed.

C. Informational Submittals: Architect may review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Submittals not required by the Contract Documents will not be reviewed and may be discarded or returned marked "Not Reviewed."

END OF SECTION 01 3300
013300/05-05/drh

SIMON

DESIGN
GROUP
planning - retail - automotive

Data Waiver

Entity requesting Data: _____

Entity Contact: email: _____ phone#_____

Project Name: _____

Date:_____

Transferee has asked Simon Arch, LLC to provide electronic copies of, or access to, certain drawings, specifications, or other documents, CAD data files, and/or building information models (collectively, "Data") prepared by Simon Arch, LLC and/or its consultants (collectively "Simon Arch, LLC") for the Project. Simon Arch, LLC agrees to provide Transferee with the requested Data, under the terms of this Data Transfer Agreement ("Agreement").

1. The transfer of the Data is not and shall not be deemed a sale. The Data are instruments of service. Simon Arch, LLC shall be deemed the Data's author and shall retain all proprietary rights, including any copyrights, embodied therein.
2. Transferee may transfer the Data to its contractors, subcontractors, suppliers, and consultants (collectively "Others"), provided Transferee requires the Others to be bound by this Agreement as if they were the Transferee in this Agreement. Transferee and Others may use the Data only for purposes related to the Project.
3. Transferee acknowledges that anomalies and errors may occur when the Data is transferred electronically or used in an incompatible computer environment. Transferee solely accepts the risks associated with, and the responsibility for, any damages to hardware, software, computer systems, or networks related to the Data's transfer or use. Simon Arch, LLC shall have no responsibility to provide software or training to allow Transferee to use the Data.
4. Simon Arch, LLC shall have no duty to modify or update the Data. Simon Arch, LLC may retain an archival copy of the Data, which shall be conclusive proof and govern in any dispute over the Data's form or content.
5. Transferee agrees to indemnify, defend and hold Simon Arch, LLC, its officers, directors, shareholders, employees, agents, and consultants harmless from and against any and all claims, liabilities, suits, demands, losses, damages, costs, and expenses, including, but not limited to, reasonable attorneys' fees and all legal expenses and fees incurred through appeal, and all interest thereon, accruing to or resulting from any and all persons, firms or any other legal entities on account of any damages or losses to property or persons, including, but not limited to, injuries, death or economic losses, arising out of Transferee's or Others' use, reuse, transfer, or modification of the Data, except where a court or forum of competent jurisdiction determines that Simon Arch, LLC is solely liable for such damages or losses.
6. If Transferee fails to perform or observe any of the terms of this Agreement, Simon Arch, LLC may demand, and Transferee immediately shall return, the Data and any copies thereof.
7. To the extent the Data include building information models ("Models"), the parties agree to the following additional terms: (i) The Models are intended for the purpose of communicating design intent. While they may be helpful to illustrate conflicts or inconsistencies in the design, the Models may not detect all conflicts or inconsistencies. (ii) Any use of the Models for the purpose of generating quantity take-offs or cost estimates, or for fabrication, will be at the Transferee's sole risk. (iii) As with Simon Arch, LLC's other services and deliverables, the Models will be prepared using that degree of skill and care exercised by licensed professionals practicing in the same community, under the same or similar circumstances. The Models may contain, or be based upon, data or information provided by others. Simon Arch, LLC has relied upon such data or information as is consistent with this standard of care. (iv) Information contained in the Models will not be construed to dictate construction means or methods, which will remain the contractor's responsibility. (v) To the extent of any conflict between information contained in, or generated by, the Models and Simon Arch, LLC's drawings and specifications, the latter documents will prevail.
8. This Agreement shall be governed by the law of the location of Simon Arch, LLC's office identified at the bottom of this Agreement.
9. In any legal proceeding to enforce this Agreement, the prevailing party shall be entitled to recover its reasonable attorneys' fees and costs of defense.
10. Unless otherwise explicitly agreed to in writing by the parties, this Agreement shall govern any and all future data transfers to Transferee by Simon Arch, LLC.

Simon Arch Authorization By: _____

PO Box 469
Deerfield, Illinois 60015

Tel (847) 571-3814
simon_yu@simon-arch.com

Advancement of Construction Technology

SUBMITTAL TRANSMITTAL

Project: _____ Date: _____

_____ A/E Project Number: _____

TRANSMITTAL A

To (Contractor): _____ Date: _____ Submittal No. _____

From (Subcontractor): _____ By: _____ ☐ Resubmission

Qty.	Reference / Number	Title / Description / Manufacturer	Spec. Section Title and Paragraph / Drawing Detail Reference

☐ Submitted for review and approval
☐ Resubmitted for review and approval
☐ Complies with contract requirements
☐ Will be available to meet construction schedule
☐ A/E review time included in construction schedule
☐ Substitution involved - Substitution request attached
☐ If substitution involved, submission includes point-by-point comparative data or preliminary details
☐ Items included in submission will be ordered immediately upon receipt of approval

Other remarks on above submission:

☐ One copy retained by sender

TRANSMITTAL B

To (A/E): _____ Attn: _____ Date Rec'd by Contractor: _____

From (Contractor): _____ By: _____ Date Trnsmt'd by Contractor: _____

☐ Approved
☐ Approved as noted
☐ Revise / Resubmit
☐ Rejected / Resubmit

Other remarks on above submission:

☐ One copy retained by sender

TRANSMITTAL C

To (Contractor): _____ Attn: _____ Date Rec'd by A/E: _____

From (A/E): _____ ☐ Other By: _____ Date Trnsmt'd by A/E: _____

☐ Approved
☐ Approved as noted
☐ Not subject to review
☐ No action required
☐ Revise / Resubmit
☐ Rejected / Resubmit
☐ Approved as noted / Resubmit
☐ Provide file copy with corrections identified
☐ Sepia copies only returned
☐ Point-by-point comparative data required to complete approval process
☐ Submission Incomplete / Resubmit

Other remarks on above submission:

☐ One copy retained by sender

TRANSMITTAL D

To (Subcontractor): _____ Attn: _____ Date Rec'd by Contractor: _____

From (Contractor): _____ By: _____ Date Trnsmt'd by Contractor: _____

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ One copy retained by sender

September 1996
CSI Form 12.1A

Advancement of Construction Technology

SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS LIST

Project: _____

_____

To (A/E): _____

_____

From (Contractor): _____

Date: _____

A/E Project Number: _____

Contract For: _____

List Subcontractors and Major Material Suppliers proposed for use on this Project as required by the Construction Documents. Attach supplemental sheets if necessary.

Section Number	Section Title	Firm	Address	Phone Number (Fax Number)	Contact

☐ Attachments

Signed by: Date:

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

July 1994
CSI Form 1.5A

SECTION 01 4000 – QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:
   1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
   2. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
   3. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect. Specify specific requirements for mockup size, location, composition and final disposition (removal or incorporation into the Work) of mockups in individual specification Sections.

C. Mockups: Full-size assemblies erected on-site and used to demonstrate qualities of materials and execution; to review construction, coordination, testing or operation; to illustrate finishes and materials; to verify selections make under Sample submittals; and to demonstrate aesthetic effects. Mockups are not Samples. Mockups establish the standard by which Work will be judged.
   1. Benchmark Samples: A type of mockup used to illustrate the application and aesthetic effect of finishes and coatings. Benchmark Samples establish the standard by which the Work will be judged.

D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Description of test and inspection.
   3. Identification of applicable standards.
   4. Identification of test and inspection methods.
   5. Number of tests and inspections required.
   6. Time schedule or time span for tests and inspections.
   7. Entity responsible for performing tests and inspections.
   8. Requirements for obtaining samples.

D. Testing Agency and Inspection Reports: Prepare and submit certified written reports that include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Ambient conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.

13. Recommendations on retesting and reinspecting.

E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced and expert in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
1. Contractor responsibilities include the following:
   a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect through the Construction Manager with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect and Construction Manager 7 days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

A. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
   a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
6. Provide quality assurance and control services required due to changes in the Work proposed by or made by the Contractor.
7. Provide quality control services for Work done contrary to the Contract Documents, without prior notice, when so specified, or without proper supervision.
8. Overtime expenses and schedule delays accruing as a result of executing quality control services shall be the Contactor’s responsibility and shall not be charged to the Owner.

B. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.

1. Testing agency will notify Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect through the Construction Manager with copy to Contractor and to authorities having jurisdiction.
3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Testing agency will retest and reinspect corrected work.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents. Architect retains the right to require the use of a different testing agency for retesting ad reinspecting.

E. Testing Agency Responsibilities: Cooperate with Architect Construction Manager and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Construction Manager and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
5. Do not perform any duties of Contractor.
6. Attend Project progress meetings as requested by Architect.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field-curing of test samples.
5. Delivery of samples to testing agencies or arranging for pick-up of test samples after normal business hours..
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule with Contractor's Construction Schedule as specified in Division 01 Section "Construction Progress Documentation."
   1. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 4000
01400/9-98/bac

SECTION 01 4200 – REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations. Installers shall be experienced in the operation they are engaged to perform.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

J. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

K. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

L. "As Required": As required by regulatory bodies, by referenced standards, by existing conditions, by generally accepted construction practice or by the Contract Documents. In the event of ambiguity or conflicts, the most stringent requirements shall apply.

M. "By Others" refers to work that is not a part of the Contract.

N. "N.I.C.": "Not in Contract" means the work or the item indicated is not a part of the Contract and will be provided by the Owner.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
   1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.

E. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	 (800) 872-2253 (202) 272-5434
CFR	Code of Federal Regulations Available from Government Printing Office http://www.gpoaccess.gov/cfr	 (888) 293-6498 (202) 512-1530
FS	Federal Specification Available from General Services Administration http://apps.fas.gsa.gov/pub/fedspecs/	(202) 619-8925
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-5434

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1. Where abbreviations and acronyms used in Specifications or other Contract Documents are not defined herein, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S" available in most public libraries.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
ACI	American Concrete Institute www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216

ADC	Air Diffusion Council www.flexibleduct.org	(847) 706-6750
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association http://domensino.com/AHA/	(847) 934-8800
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America www.landcarenetwork.org	(800) 395-2522 (703) 736-9666
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANLA	American Nursery & Landscape Association (Formerly: AAN - American Association of Nurserymen) www.anla.org	(202) 789-2900
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989

ARI	Air-Conditioning & Refrigeration Institute (now AHRI)	
ASA	Acoustical Society of America http://asa.aip.org	(516) 576-2360
ASC	Adhesive and Sealant Council, The www.ascouncil.org	301-986-9700
ASCA	Architectural Spray Coaters Association	(609) 848-6120
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASPE	American Society of Plumbing Engineers www.aspe.org	(773) 693-2773
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
AWCI	Association of the Wall and Ceiling Industries International www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (now WCMA)	
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood Protection Association (formerly American Wood-Preservers' Association) www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353

BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
CCC	Carpet Cushion Council www.carpetcushion.org	(610) 527-3880
CCFSS	Center for Cold-Formed Steel Structures www.ccfssonline.org	(573) 341-4471
CDA	Copper Development Association Inc. www.copper.org	(212) 251-7200
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CFI	International Certified Floorcovering Installers Association www.cfi-installers.org	(816) 231-4646
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CPA	Composite Panel Association www.pbmdf.com	(703) 724-1128
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association	(800) 968-7945

	www.eifsfacts.com	(770) 968-7945
EJMA	Expansion Joint Manufacturers Association, Inc. www.eima.com	(914) 332-0400
FMGlobal	FMGlobal (formerly FMG – FMGlobal) www.fmglobal.com	(401) 275-3000
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GA	Gypsum Association www.gypsum.org	(301) 277.8686
GANA	Glass Association of North America (formerly: FGMA - Flat Glass Marketing Association) www.glasswebsite.com	(785) 271-0208
GS	Green Seal www.greenseal.org	(202) 872-6400
GTA	Glass Tempering Division of Glass Association of North America (see GANA)	
HMMA	Hollow Metal Manufacturers Association (part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
ICRI	International Concrete Repair Institute www.icri.org	(847) 827-0830
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IES	Illuminating Engineering Society www.ies.org	(212) 248-5000
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
ILI	Indiana Limestone Institute of America, Inc.	(812) 275-4426
ITS	Intertek Testing Services (now ETL Semco)	

LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MFMA	Maple Flooring Manufacturers Association www.maplefloor.org	(888) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MGPHO	Medical Gas Professional Healthcare Organization, Inc. www.mgpho.org	(877) 238-5157 (913) 681-6548
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MIA	Masonry Institute of America www.masonryinstitute.org	(213) 388-0472
ML/SFA	Metal Lath/Steel Framing Association (see SSMA)	
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(630) 942-6591
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association Inc. www.nbgqa.com	(800) 557-2848
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical and Medical Imaging Equipment Manufacturers Association www.nema.org	(703) 841-3200
NFPA	NFPA (National Fire Protection Association)	(800) 344-3555

	www.nfpa.org	(617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-6372
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association) (formerly National Oak Flooring Manufacturers Association) www.nofma.org	(901) 526-5016
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSA	National Stone, Sand and Gravel Association (NSSA) www.nssa.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo and Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930
NWWDA	National Wood Window and Door Association (now WDMA)	
PCA	Portland Cement Association www.cement.org	(847) 966-6200
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting and Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
RCSC	Research Council on Structural Connections www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute www.rfci.com	(706) 882-3833
RIS	Redwood Inspection Service www.redwoodinspection.com	(925) 935-1499
RMA	Rubber Manufacturers Association	(800) 220-7620

	www.rma.org	(202) 682-4800
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(847) 458-4647
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(877) 294-5424 (516) 294-5424
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIGMA	Sealed Insulating Glass Manufacturers Association	(312) 644-6610
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SPFA	Spray Polyurethane Foam Alliance www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau www.spib.org	(850) 434-2611
SPRI	Single Ply Roofing Institute www.spri.org	(781) 647-7026
SSMA	Steel Stud Manufacturers Association (Formerly: ML/SFA - Metal Lath/Steel Framing Association) www.ssma.com	(630) 942-6592
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, and Restoration Institute www.swrionline.org	(816) 472-7974
TCNA	Tile Council of North America, Inc. www.tileusa.com	(864) 646-8453
TIA	Telecommunications Industry Association/Electronic	(703) 907-7700

	Industries Alliance www.tiaonline.org	
UFAC	Upholstered Furniture Action Council www.ufac.org	(336) 885-5065
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association www.wcmanet.org	(212) 297-2122
WDMA	Window & Door Manufacturers Association www.wdma.com	(800) 223-2301 (312) 321-6802
WI	Woodwork Institute www.wicnet.org (formerly Woodwork Institute of California)	(916) 372-9943
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 472-7233

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CPSC	Consumer Product Safety Commission	(800) 638-2772

	www.cpsc.gov	(301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
EPA	Environmental Protection Agency www.epa.gov	(202) 260-2090
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(202) 708-5082
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(202) 693-1999
TRB	Transportation Research Board www.trb.org	(202) 334-2934
USPS	Postal Service www.usps.com	(202) 268-2000

D. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CAPUC	(See CPUC)	
CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation www.dca.ca.gov/bhfti	(800) 952-5210 (916) 445-1254
CPUC	California Public Utilities Commission www.cpuc.ca.gov	(415) 703-2782

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00
01420/11-00/bac

SECTION 01 5000 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:
   1. Sewers and drainage.
   2. Water service and distribution.
   3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
   4. Heating and cooling facilities.
   5. Ventilation.
   6. Electric power service.
   7. Lighting.
   8. Telephone & Internet service.

C. Support facilities include, but are not limited to, the following:
   1. Project identification and temporary signs.
   2. Waste disposal facilities.
   3. Storage and fabrication sheds.
   4. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:
   1. Temporary partitions.
   2. Fire protection.

1.2 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
   1. Architect.
   2. Testing agencies.
   3. Personnel of authorities having jurisdiction.

B. Water Service: Use water from Owner's existing water system without metering and without payment of use charges.

C. Electric Power Service: Use electric power from Owner's existing system without metering and without payment of use charges.

1.3 SUBMITTALS

A. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Within 15 days of date established for submittal of Contractor's Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.

1.4 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
   1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
   2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
   1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
   1. Keep temporary services and facilities clean and neat.
   2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Provide dressed lumber, S4S, unless otherwise indicated.
   3. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2 inch nominal thickness or less, unless otherwise indicated.

B. Plywood: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch (12.7 mm) thick.

C. Gypsum Board: Minimum 1/2 inch (12.7 mm) thick by 48 inches (1219 mm) wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36.

D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively.

E. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

F. Water: Potable.

2.2 EQUIPMENT

A. General: Provide equipment suitable for use intended.

B. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

C. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

D. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.
1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7.2 to 12.7 deg C).

E. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

F. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

G. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

H. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
   2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
   3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.

B. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
   1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
   2. Connect temporary sewers to municipal system as directed by sewer department officials.
   3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
   4. Retain subparagraph below if required. Revise to suit local requirements.
   5. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

C. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
   1. Provide rubber hoses as necessary to serve Project site.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
   1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
   2. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
   3. Toilets: Where required, install self-contained toilet units. Shield toilets to ensure privacy.
   4. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7.2 to 12.7 deg C).

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.
   1. Maintain a minimum temperature of 50 deg F (10 deg C) in permanently enclosed portions of building for normal construction activities, and 65 deg F (18.3 deg C) for finishing activities and areas where finished Work has been installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

H. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
   1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

J. Telephone & Internet Service: Provide temporary telephone and Internet service throughout construction period for common-use facilities used by all personnel engaged in construction activities.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines. Comply with NFPA 241.
3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.

C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 01 Section "Execution" for progress cleaning requirements.
1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
2. Develop a construction waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

D. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

E. Existing Elevator Usage: Use of Owner's existing elevators will be permitted, as long as elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
1. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

F. Existing Stair Usage: Use of Owner's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable

effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

C. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

D. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
1. Construct dustproof partitions of not less than nominal 4-inch (100-mm) studs, 5/8-inch (16-mm) gypsum wallboard with joints taped on occupied side, and 1/2-inch (13-mm) fire-retardant plywood on construction side.
2. Retain subparagraph above or subparagraph and associated subparagraph below. Retain below where containment of airborne particles and dust generated by construction activities is critical to occupants of other spaces in building, e.g., occupied healthcare facilities.
3. Construct dustproof, floor-to-ceiling partitions of not less than nominal 4-inch (100-mm) studs, 2 layers of 3-mil (0.07-mm) polyethylene sheets, inside and outside temporary enclosure. Cover floor with 2 layers of 3-mil (0.07-mm) polyethylene sheets, extending sheets 18 inches (460 mm) up the side walls. Overlap and tape full length of joints. Cover floor with 3/4-inch (19-mm) fire-retardant plywood.
    a. Construct a vestibule and airlock at each entrance to temporary enclosure with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.
4. Insulate partitions to provide noise protection to occupied areas.
5. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
6. Protect air-handling equipment.
7. Weatherstrip openings.

E. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
    a. Field Offices: Class A stored-pressure water-type extinguishers.
    b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
    c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
7. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
8. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Consider inserting specific removal requirements, as illustrated below.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 01 Section "Closeout Procedures."

END OF SECTION 01 50 00
015000/05-05/drh

SECTION 01 6000 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:
   1. Division 01 Section "References" for applicable industry standards for products specified.
   2. Division 01 Section "Closeout Procedures" for submitting warranties for contract closeout.
   3. Divisions 03 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility.
   3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents as proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name, installer's name and proprietary product names for each product.
   1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
   2. Form: Tabulate information for each product under the following column headings:
      a. Generic name used in the Contract Documents.
      b. Proprietary name, model number, and similar designations.
      c. Manufacturer's name and address.
      d. Supplier's name and address.
      e. Installer's name and address.
      f. Projected delivery date or time span of delivery period.
      g. Identification of items that require early submittal approval for scheduled delivery date.
   3. Completed List: Within 30 days after Owner's Authorization to proceed with construction, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
   4. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use form provided at end of Section.
   2. Documentation: Show compliance with requirements for substitutions Architect's Action: If necessary, Architect will request additional information or documentation for evaluation. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
      a. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
   5. Store products to allow for inspection and measurement of quantity or counting of units.
   6. Store materials in a manner that will not endanger Project structure.
   7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   9. Protect stored products from damage.

B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
   3. Refer to Divisions 03 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

A. This Article defines procedures for product selection. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: Unless custom products or nonstandard options are specified, provide products of both quality and type that have been used successfully in similar situations on equal quality projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.
   5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
   6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Substitutions:
   1. Substitutions may be considered.

C. Product Selection Procedures: Procedures for product selection include the following:
   1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
   2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
   3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
   4. Subparagraphs titled "Products" above and "Manufacturers" below correspond to Closed Proprietary Specifications with optional products if no substitutions are permitted, as described in CSI's "Manual of Practice." If substitutions may be considered, they correspond to Open Proprietary Specifications with controlled substitutions or bidder-proposed substitutions, if the Instructions to Bidders so indicate.
   5. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
   6. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
   7. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

8. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
9. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
10. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Product[**s**]" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
11. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
    a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.
12. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
13. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 01 for allowances that control product selection and for procedures required for processing such selections.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 30 days after the notice of award. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect

for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
   1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
   2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   3. Evidence that proposed product provides specified warranty.
   4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
   5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 6000
01600/9-98/ba

Substitution Request

Gensler

Project	**Date**
Project Location	**Project Number**
General Contractor	**File** 6S
Prepared by	**This is page** 1 of

We certify that the following product is equal or superior to the specified product in appearance, durability, performance, and in every other respect, and we hereby submit it for your consideration as a substitute for the specified item for the above-mentioned project:

1. **Specified Item** **Section**
2. **Proposed Substitution**

3. **Reason for Substitution**

4. **Costs** (Provide a complete breakdown of costs, including the cost amount to be DEDUCTED from the Contract Sum if the proposed substitution is accepted. Include documentation for both materials and labor.)

5. **Schedule** (Describe substitution's affect on construction schedule)

6. **Supporting Data**
   - **Cutsheets: Attach complete technical data, including laboratory tests, if applicable.**
   - **Installation: Include complete information on changes to Drawings and/or Specifications describing the steps that the proposed substitution will require for its proper installation.**
   - **Samples: Submit with request all necessary samples and substantiating data clearly marked to prove equal quality and performance to that which is specified.**
7. **List ways in which the substitution affects dimensions shown on Drawings.**

8. **List affects of proposed substitution on other trades**

9. **List ways in which proposed substitution will be affected by applicable code requirements and agency approval**

10. **List differences between proposed substitution and specified item**

11. **Manufacturer's warranties of the proposed and specified items are:** ☐ **Same** ☐ **Different**

Explain

12. **List information on availability of maintenance service and source of replacement materials**

13. **Certification of, and Assumption of Liability for, Equivalent Performance**

The undersigned certifies that the function, appearance and quality of the proposed substitution is equivalent or superior to the specified item and is in full compliance with the Contract Documents and applicable regulatory requirements.

Supplier		**Signature**	
Telephone No.		**Date**	

Signature must be by person authorized to legally bind his/her firm to the above terms. Failure to provide legally binding signature will result in retraction of approval.

General Contractor		**Signature**	
Telephone No.		**Date**	

SECTION 01 7300 – EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. General installation of products.
   3. Coordination of Owner-installed products.
   4. Progress cleaning.
   5. Starting and adjusting.
   6. Protection of installed construction.
   7. Correction of the Work.

B. Related Sections include the following:
   1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
   2. Division 01 Section "Submittal Procedures" for submitting surveys.
   3. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
   4. Revise below to suit Project.
   5. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
   1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
      a. Description of the Work.
      b. List of detrimental conditions, including substrates.
      c. List of unacceptable installation tolerances.
      d. Recommended corrections.
   2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Architectural & M.E.P. Drawings. If discrepancies are discovered, notify Architect and Construction Manager promptly.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 8'-0" in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction forces.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 7300
017300/5-05/drh

SECTION 01 7329 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:
   1. Division 02 Section "Selective Demolition" for demolition of selected portions of the building for alterations.

1.2 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
   1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
   2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
   3. Products: List products to be used and firms or entities that will perform the Work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Delete subparagraph below if utilities are not affected by cutting and patching. Expand to include special requirements to suit Project.
   6. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
   7. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
   8. Architect's & Construction Manager's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
   1. Primary operational systems and equipment.
   2. Air or smoke barriers.
   3. Fire-protection systems.
   4. Control systems.
   5. Communication systems.
   6. Conveying systems.
   7. Electrical wiring systems.
   8. Plumbing systems.
   9. Mechanical Systems.

B. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

C. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Masonry & Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 01 7329
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SECTION 01 7700 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection procedures.
   2. Project Record Documents.
   3. Operation and maintenance manuals.
   4. Warranties.
   5. Instruction of Owner's personnel.
   6. Final cleaning.

B. Related Sections include the following:
   1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
   2. Division 01 Section "Construction Progress Documentation" for submitting Final Completion construction photographs and negatives.
   3. Division 01 Section "Execution Requirements" for progress cleaning of Project site.
   4. Delete subparagraph below if Project Record Document requirements are retained in this Section.
   5. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of Architect and Construction Manager.
      d. Name of Contractor.
      e. Page number.

1.6 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's and Construction Manager's reference during normal working hours.

B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
   1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
      a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later, and those locations of those items that need to be located for servicing.
      b. Accurately record information in an understandable drawing technique.
      c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
      d. Mark Contract Drawings completely and accurately.
      e. Mark important additional information that was either shown schematically or omitted from original Drawings.
      f. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
   2. At the completion of the Project and at the Contractor’s expense, produce a set of CAD compact disks and incorporate all changes noted on the marked work prints.
      a. CAD compact disks shall be prepared by a skilled CAD draftsperson using the software platform as requested by the Owner. If CAD software is not specified by Owner, use same software as the Architect’s original drawings.
      b. Mark each sheet “Record Drawings,” with the date of Final Completion.
   3. Deliver one full set of reproducible drawing plots and the CAD compact disks to the Architect.

C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Clearly mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Note related Change Orders, Record Drawings and Product Data where applicable.

D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Drawings and Record Specifications where applicable.

E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections such as tests and inspections, surveys, mix records and inspections by authorities having jurisdiction. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Operation Data:
   a. Emergency instructions and procedures.
   b. System, subsystem, and equipment descriptions, including operating standards.
   c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
   d. Description of controls and sequence of operations.
   e. Piping diagrams.
2. Maintenance Data:
   a. Manufacturer's information, including list of spare parts.
   b. Name, address, and telephone number of Installer or supplier.
   c. Maintenance procedures.
   d. Maintenance and service schedules for preventive and routine maintenance.
   e. Maintenance record forms.
   f. Sources of spare parts and maintenance materials.
   g. Copies of maintenance service agreements.
   h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.8 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
   1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Provide instructors experienced in operation and maintenance procedures.
   2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
   3. Schedule training with Owner through Construction Manager with at least seven days' advance notice.
   4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
   1. System design and operational philosophy.
   2. Review of documentation.
   3. Operations.
   4. Adjustments.
   5. Troubleshooting.
   6. Maintenance.
   7. Repair.

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
      a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
      c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
      d. Remove tools, construction equipment, machinery, and surplus material from Project site.
      e. Remove snow and ice to provide safe access to building.
      f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
      g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
      h. Sweep concrete floors broom clean in unoccupied spaces.
      i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
      j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
      k. Remove labels that are not permanent.
      l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

n. Replace parts subject to unusual operating conditions.

o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

q. Clean ducts, blowers, and coils if units were operated without filters during construction.

r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

s. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 7700
01170/9-98

SECTION 02 4119 – SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Demolition and removal of selected portions of a building or structure.
   2. Repair procedures for selective demolition operations.
   3. Salvage of existing items to be reused or recycled.

B. Related Sections include the following:
   1. Division 01 Section "Work Restrictions" for restrictions on use of the premises due to Owner or tenant occupancy.
   2. Division 01 Section "Construction Progress Documentation" for preconstruction photographs taken before selective demolition.
   3. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
   4. Division 01 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 SUBMITTALS

A. Qualification Data: For demolition firm.
   1. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.

C. Schedule of Selective Demolition Activities: Indicate the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services and duration of interruption.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Locations of temporary partitions and means of egress affected by selective demolition operations.
6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
7. Means of protection for items to remain and items in path of waste removal from building.

D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

E. Pre-demolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

F. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
1. Comply with submittal requirements in Division 01 Section "Construction Waste Management and Disposal."

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Professional Engineer Qualifications: Comply with Division 01 Section "Quality Requirements."

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

E. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

F. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
1. Inspect and discuss condition of construction to be selectively demolished.

2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.6 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner assumes no responsibility for condition of areas to be selectively demolished.
1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
2. Before selective demolition, coordinate existing items to be relocated with owner.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. Storage or sale of removed items or materials on-site will not be permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.
1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials.

B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
   1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services indicated to remain and protect them against damage during selective demolition operations.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. Delete subparagraph above or first subparagraph below to suit Project.
   3. Arrange to shut off indicated utilities with utility companies.
   4. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   5. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
      a. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.
   6. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
      a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

C. Utility Requirements: Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
   1. Pest Control: Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during selective demolition operations.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
   2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
   3. Protect existing site improvements, appurtenances, and landscaping to remain.
   4. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

C. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   3. Cover and protect furniture, furnishings, and equipment that have not been removed.
   4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

D. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

E. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

F. Temporary Shoring: Provide and maintain interior shoring, bracing, and structural supports to preserve stability and prevent movement, settlement, or collapse of construction indicated to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
   1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
   2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   9. Dispose of demolished items and materials promptly.
   10. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.

B. Existing Facilities: Comply with Owner's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.

C. Removed and Reinstalled Brick: Comply with the following:
   1. Clean and repair brick to functional condition adequate for intended reuse.

2. Pack or crate after cleaning Identify contents of containers.
3. Protect brick from damage during transport and storage.
4. Reinstall in locations indicated. Comply with installation requirements for new materials. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition, cleaned and reinstalled in their original locations after selective demolition operations are complete.

PATCHING AND REPAIRS

E. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

F. Patching: Comply with Division 01 Section "Cutting and Patching."

G. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.

H. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

I. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
2. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.8 SELECTIVE DEMOLITION SCHEDULE

A. Coordinate with Architect and Construction Manager.

B. Existing construction to be removed where noted on the drawings: Aluminum Curtain Wall, Storefront and Glazing; plaster soffits and ceilings as required to install new curtain wall systems.

C. Existing Items to Remain: Steel columns and beams; stone facings;

END OF SECTION 02 4119
024119/5-05/drh

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. The General and Supplementary Conditions of the Construction Contract and Division 1 -

A. General Requirements apply to the work specified in this section.

B. The work includes all items required for executing and completing the cast-in-place concrete work and related work shown on the drawings or specified herein. Work shall include installation of items furnished in other sections of these specifications.

C. Concrete paving, walks, and curbs are specified in Division 3 or 32.

D. Structural notes indicated on the drawings regarding Cast-In-Place concrete shall be considered a part of this specification.

1.2 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified herein:

1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
2. ACI 301 - Standard Specifications for Structural Concrete
3. ACI 304 - Recommended Practice of Measuring, Mixing, Transporting and Placing Concrete.
4. ACI 309 - Guide for Construction of Concrete.
5. ACI 311 - Recommended Practice of Concrete Inspection.
6. ACI 318 - Building Code Requirements for Reinforced Concrete.
7. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
8. ASTM C33 - Standard Specification for Concrete Aggregates.
9. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
10. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
11. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
12. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
13. ASTM C150 - Standard Specification for Portland Cement.
14. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
15. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
16. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
17. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
18. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
19. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
20. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or CalcinedNatural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
21. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
22. ASTM C1064 - Standard Test Method for Temperature of Freshly MixedPortland Cement Concrete.
23. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

24. ASTM E329 –Standard Specification for Agencies Engaged in Testing and/or Inspection of Material Used in Construction
25. ASTM D1751 - Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
26. ASTM E154 - Standard Test Method for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover. Concrete Reinforcing Steel Institute (CRSI) - Manual of Standard Practice.

B. Comply with all local building code requirements which are more stringent than those listed above All referenced codes or standards shall be the most currently adopted as of the date for Receipt of Proposal.
C. Where any provision of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.
D. Maintain records verifying materials used are of the specified and accepted types and sizes and are in conformance with the requirements of the Contract Documents.
E. Use of testing services will not relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.

1.3 TESTING AND INSPECTION

A. Special Inspection and Testing:

1. In accordance with Chapter 17 of the 200 International Building Code, the Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704.0.
2. Refer to architectural, civil, mechanical, and electrical specifications for testing and inspection requirements of non-structural components.
3. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected per the table below. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specification to the building official and the Architect and Engineer of Record.
4. Duties of the Special Inspection Agency:
    a. Perform all testing and inspection required per approved testing and inspection program.
    b. Furnish inspection reports to the building official, the Owner, the
    c. Architect, the Engineer of Record, and the General Contractor. The
    d. reports shall be completed and furnished within 48 hours of inspected
    e. work.

Submit a final signed report stating whether the work requiring special

    f. inspection was, to the best of the Special Inspection Agency's knowledge
    g. in conformance with the approved plans and specifications.

5. Structural Component Testing and Inspection Schedule for Section 03 30 00 is as follows:
    a. Concrete and Concrete Placement
        i. Review of proposed mix design and supporting test results
            1. Testing frequency: Periodic
            2. Referenced Standard:
            3. IBC Referenced:
        ii. Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased
            1. Testing frequency: Continuous
            2. Referenced Standard:
            3. IBC Referenced: 1912.5
        iii. Verifying use of required design mix

1. Testing frequency: Periodic
2. Referenced Standard: ACI 318: Ch. 4, 5.2-5.4
3. IBC Referenced: 1704.4, 1904, 1905.2-1905.4, 1914.2

iv. Sampling fresh concrete and performing slump, air content and determining the temperature of fresh concrete at the time of making specimens for strength tests.
1. Testing frequency: Continuous
2. Referenced Standard: ASTM C172, ASTM C31, ACI 318: 5.6, 5.8
3. IBC Referenced: 1704.4, 1905.6

v. Inspection of concrete placement for proper application techniques
1. Testing frequency: Continuous
2. Referenced Standard: ACI 318: 5.9, 5.10
3. IBC Referenced: 1704.4, 1905.9, 1905.10

vi. Inspection for maintenance of specified curing temperature and techniques.
1. Testing frequency: Periodic
2. Referenced Standard: ACI 318: 5.11 - 5.13
3. IBC Referenced: 1704.4, 1905.11, 1905.13

vii. Verification of in-situ concrete strength, prior to removal of shores and forms from beams and structural slabs
1. Testing frequency: Periodic
2. Referenced Standard: ACI 318: 6.2
3. IBC Referenced: 1906.2

B. Sampling and testing requirements:

1. Take samples of fresh concrete at the job site for each mix design placed each day. Sampling and testing shall be done after the final addition and proper mixing of any water or admixtures that are added on site.
   a. Personnel and testing equipment shall meet the requirements of ASTM E329.
   b. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
      1) On a given project, if the total volume of concrete is such that the frequency of testing required above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.
   c. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days.

2. For each sample of fresh concrete, perform the following duties:
   a. Measure and record slump in accordance with ASTM C143.
   b. Measure and record temperature in accordance with ASTM C1064.
      1) Provide one test hourly when air temperature is 40°F (4.4°C) and below and when 80°F (27°C) and above, and one test for each composite sample.
   c. Measure and record air content by volume in accordance with either ASTM C231 or ASTM C173.
   d. Mold three cylinders (laboratory cylinders) in accordance with ASTM C31 to be laboratory-cured. Protect from moisture loss and maintain at 60°F to 80°F for 24 to 48 hours before moving. Deliver cylinders to testing laboratory for curing and testing.

e. Mold one cylinder (field cylinder) in accordance with ASTM C31 to be field-cured. Field cylinder shall be placed as near as possible to the in place concrete from which it was taken, protected, and cured in the same manner. Deliver field-cured cylinder to testing laboratory, and measure and record compressive strength in accordance with ASTM C39. Field cylinder shall be used to determine if concrete footings, walls, or piers have reached the required compressive strength for steel erection to begin.

3. Measure and record compressive strength in accordance with ASTM C39 for laboratory cylinders. Test one laboratory cylinder at 7 days and all other cylinders at 28 days. Acceptance is based on the average of the two laboratory cured 28-day tests. Notify Architect in the event strength levels do not meet the acceptance requirements of ACI 318.
    a. Any additional cylinders molded for Contractor to have a compressive strength test done before seven days shall be at the Contractor's expense.
4. Prepare and submit test reports to the Architect, Engineer, Contractor, and Supplier. Reports shall be completed and furnished within 48 hours of testing. Refer to description in Submittals.
5. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

1.4 SUBMITTALS

A. Concrete Materials: Submit information on concrete materials as listed below.
    1. Cementitious materials: Submit type, class, producer name, and certification not more than 90 days old of compliance with applicable ASTM standard.
    2. Aggregates: Submit type, pit or quarry location, producer name, gradations, specific gravity, water content, and certification not more than 90 days old.
    3. Admixtures: Submit product data sheet. Product data shall include: dosages and performance data, brand names, producers, chloride ion concentrations, and certifications of compliance with applicable ASTM standard. Certifications shall not be more than 90 days old.
    4. Water: Submit name of source.
B. Product Data: Prepare and submit product and performance data for materials and accessories, including patching compounds, waterstops, joint systems, finish materials and other concrete related items.
C. Testing Agency Qualifications: When requested, the proposed testing agencies shall submit data on qualifications for acceptance.
D. Concrete Mix Design:
    1. Concrete mix design submittals shall be submitted at least 14 days prior to placing concrete.
    2. Submit concrete mixture proportions and characteristics for each concrete mix. Include standard deviation analysis or trial batch data with mix design. Submit historical field test data to demonstrate the average compressive strength for approval. Concrete mix proportions, materials, and handling methods for field test data or trial batches shall be the same as used for the work.
    3. If trial batches are used, submit representative samples of each proposed ingredient to independent testing laboratory for use in preparation of mix design.
    4. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

    Indicate amounts of mix water to be withheld for later addition at Project site
E. Concrete Finish Shop Drawings: Submit drawings indicating type of finish to be used at each location.

F. Slab-on-Grade Control Joint Layout: Submit drawings for proposed slab-on-grade control joint layout for approval.
G. Test Reports: Submit laboratory test reports for concrete materials, mix design, compressive strength, slump, air content, and temperature. Each report shall indicate date of sampling, date of test, mix design, and location of concrete in structure.
H. Repair Methods: When stains, rust, efflorescence, and surface deposits must be removed, submit the proposed method of removal.
I. Certificates: Submit written certification regarding the design mix from the ready-mix supplier and the admixture manufacturer stating all concrete and admixtures do not contain chloride ions in excess of concentrations specified herein.
J. Placement Notification: Notify the Architect at least 24 hours in advance of concrete placement.
K. Pumping Notification: Submit notification if concrete is to be pumped.
L. Adjustments: Submit any adjustments to mixture proportions or changes in materials suppliers, or sources along with supporting documentation during the course of the work.

1.5 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. Cementitious materials: Store cementitious materials in dry weather tight buildings, bins, or silos that exclude contaminants.
B. Aggregates: Store and handle aggregate in a manner that will avoid segregation and prevent contamination with other materials or other sizes of aggregates. Store aggregates so as to drain freely.
C. Admixtures: Protect stored admixtures against contamination, evaporation, or damage.
D. Protect liquid admixtures from freezing and temperature changes, which would adversely affect their performance. Handle chemical admixtures in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: Portland cement shall conform to ASTM C150, Type I Normal, and be a standard brand of Portland cement. Use one brand of cement throughout project, unless approved in writing by the Engineer. Cement, which conforms to ASTM C150 Type II, may be used if it also meets the requirements of ASTM C150 Type I. Cement used in concrete shall be of the same brand and type as the cement used in the concrete represented by the submitted field test data or used in the trial mixtures. Maintain consistent cement color throughout project unless directed otherwise by architectural requirements.
    1. Total replacement of Portland cement in design mixture shall not exceed 50% (by-weight).
B. Fly Ash: Fly ash shall conform to ASTM C618, Class C or Class F. Replacement of Portland cement by fly ash shall not exceed the following (percentages are by weight):
    1. Concrete Flatwork: 15 percent.
    2. Concrete to be placed in cold weather as defined herein: No fly ash allowed.
    3. All other concrete: 25 percent.
C. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
    1. Blended Ingredients – 25-50% by weight of blast furnace slag.
    2. Grade 100 – Slags with a moderate activity index
D. Blended Hydraulic Cement: ASTM C 595M, Type IS, Portland blast-furnace slag cement.
    1. Blended Ingredients – 25-50% by weight of blast furnace slag.
E. Blended Hydraulic Cement: ASTM C 595M, Type IP, Portland-Pozzolan cement.
    1. Blended Ingredients – 15-40% by weight of Pozzolan (fly ash).

F. Blended Hydraulic Cement: ASTM C 595M, Type I (PM), Pozzolan-modified Portland cement.
1. Blended Ingredients – 0-15% by weight of Pozzolan (fly ash) (modified).

G. Blended Hydraulic Cement: ASTM C 595M, Type I (SM), slag-modified Portland cement.
1. Blended Ingredients – 0-25% by weight of blast furnace slag (modified).

H. Coarse Aggregate for Normal Weight Concrete: Comply with ASTM C33. Provide coarse aggregate from a single source for exposed concrete. Gradations shall be similar to that described in the following table:

I. Do not use aggregates containing deleterious substances that could cause spalling on any exterior exposed surface. These include, but are not limited to the following:
1. Organic impurities.
2. Ferrous metals.
3. Soluble salts.
4. Coal, lignite, or other lightweight materials.
5. Soft particles.
6. Clay lumps and friable particles.
7. Cherts of less than 2.40 specific gravity.

J. Water: Mixing water for concrete shall meet the requirements of ASTM C94. Water shall be clean and free from injurious amounts of acids, alkalies, organic materials, chloride ions and oils deleterious to concrete or reinforcing steel.

K. Testing agency shall be given access to plants and stockpiles to obtain samples for testing for compliance with the Contract Documents.

2.2 ADMIXTURES

A. Water Reducing Admixture: Material shall comply with ASTM C494, Type A, and not contain more than 0.05% chloride ions by weight. Acceptable manufacturers and products include:
1. Euclid Chemical Company - Eucon WR 75.
2. Sika Chemical Corp. - Plastocrete 161.
3. GRT – Polychem 400 NC.
4. Grace Construction Products - WRDA Hycol, or WRDA 64.

B. High Range Water Reducing Admixture (superplasticizer): Material shall comply with ASTM C494, Type F or Type G, and not contain more than 0.05% chloride ions by weight of admixture. Acceptable manufacturers and products include:
1. Euclid Chemical Company - Eucon 37.
2. Sika – ViscoCrete 2100.
3. GRT – Melchem.
4. Grace Construction Products - Daracem 100.

C. High Range Water Reducing, Slump Retaining Admixture: Material shall comply with ASTM C494, Type F or Type G, and not contain more than 0.05% chloride ions by weight of admixture. Acceptable manufacturers and products include:
1. Euclid Chemical Company - Eucon 537.
2. Sika – Sikament 686.
3. GRT – Melchem – M.
4. Grace Construction Products – ADVA FLEX.

D. Non-Chloride Accelerator: Material shall comply with ASTM C494, Type C or Type E, and not contain a higher chloride ion concentration than municipal drinking water. Acceptable manufacturers and products include:
1. Euclid Chemical Company - Accelguard 80.
2. Sika Chemical Corp. - Sika Rapid-1.

3. GRT – Polychem HE.
4. Grace Construction Products – Daraset 200.

E. Air Entraining Admixture: Air entraining admixture shall comply with ASTM C260, and be certified by the manufacturer to be compatible with other admixtures to be used. Acceptable manufacturers and products include:

1. Euclid Chemical Company - Air-Mix.
2. Sika Chemical Corporation - Sika-Aer.
3. GRT – Polychem VR.
4. Grace Construction Products - Darex or Daravair.

F. Calcium chloride or admixtures containing more than 0.05% chloride ions by weight are not permitted.

G. Admixtures used in concrete shall be the same brand, type, and dosage used in concrete represented by field test data or used in trial mixes.

2.3 CURING PRODUCTS

A. Waterproof Sheet Materials: Use 6 mil polyethylene film sheet materials.

2.4 MISCELLANEOUS MATERIALS

A. Patching Mortar: Non-shrink, non-slump, non-metallic, quick setting. Acceptable manufacturers and products:

1. Euclid Chemical Company - Eucospeed.
2. Standard Drywall Products - Thorite.
3. Set Products, Inc. - Vertipatch.
4. Tamms Industries Co. - Speed Crete.
5. Dayton Superior – RE-CRETE.

B. Expansion Joint Material: Preformed, resilient, non-extruding asphalt impregnated resilient fiber conforming to ASTM D1751. Thickness of expansion joint material shall be 1/2” unless noted otherwise on the drawings.

C. Magnesium phosphate patching cement specially designed for cold weather grouting and anchoring. Acceptable Manufacturer:

1. Set Products Inc. - Set-45.

D. Vapor Barrier: ASTM E 1745, Class A, not less than 15 mils (0.375 mm) thick. Acceptable manufacturers and products:

1. Stego Industries, LLC - Stego Wrap.
2. W.R. Grace & Co. - Florprufe 120.
3. W.R. Meadows, Inc. - Perminator.

E. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces. Acceptable manufacturers and products:

1. Conspec Marketing & Manufacturing Co., Inc. - Intraseal
2. Curecrete Chemical Co., Inc. - Ashford Formula
3. Dayton Superior Corporation - Day-Chem Sure Hard
4. Euclid Chemical Company - Euco Diamond Hard
5. L&M Construction Chemicals, Inc. - Seal Hard
6. Vexcon Chemicals, Inc - Vexcon Starseal PS

F. Control Joint Filler: Flexible, single-component polyurethane sealant with backer rod compliant with ASTM C 920, Type S, Grade P, Class 25. Apply sealant per manufacturers written recommendations. Acceptable manufacturers and products:

1. Dayton Superior – Perma 230 SL.
2. Euclid Chemical Company – Eucolastic I.

3. Sonneborn – Sonolastic SL 1.

2.5 STRENGTH AND PROPERTIES

A. Concrete Mix Designs: Refer to Drawings for specified compressive strength. Proportion concrete mixes according to the properties in the following tables. The concrete supplier may produce a mix at a lower water-cement ratio to allow for adjustment of slump at the site by adding water. The addition of site water shall be in accordance with ASTM C94, and the total water-cement ratio shall not exceed the value specified below.

1. Class B
   - Coarse Aggregate Gradation – CA7
   - Fine Aggregate Gradation – FA1
   - Range of Slump- 1" to 4"
   - Max. w/c - 0.45
   - Air Content – 5% to 8%
2. Class D
   - Coarse Aggregate Gradation - CA7
   - Fine Aggregate Gradation - FA1
   - Range of Slump - 4" to 6"
   - Max. w/c – 0.50
   - Other Requirements – Use water reducing admixture to achieve slump specified
3. Class E
   - Coarse Aggregate Gradation – CA5
   - Fine Aggregate Gradation – FA1
   - Range of Slump – 1 to 4"
   - Max. w/c – 0.50

B. Schedule of Concrete Classes: Provide concrete of the specified class according to the following schedule.

1. Footings: Class E
2. Exterior foundation walls and piers: Class B
3. Interior slabs on grade: Class D
4. Unless noted otherwise: Class B

C. Slump of Superplasticized Concrete: Concrete containing high-range water reducing admixtures (superplasticizer) shall have 8" maximum slump, unless otherwise approved by Structural Engineer. Concrete shall arrive at job site with 2" to 3" slump, be verified, then high range water reducing admixture added to increase slump to approved level.

D. Accelerators: Add non-chloride accelerator to all concrete slabs placed at air temperatures below 50°F.

E. Water Reducer: Add water reducing admixture or high range water reducing admixtures (superplasticizers) as follows:

1. All pumped concrete.
2. Concrete with water cement ratio below 0.50.

F. No other admixtures shall be used unless approved by Structural Engineer of record.

G. Chlorides: Admixtures or other ingredients including aggregates containing calcium chloride or more than 0.05% chloride ions by weight shall not be used.

H. Workability: Concrete shall have a workability such that it will fill the forms without voids, honeycombs, or rock pockets with proper vibration without permitting materials to separate or excess water to collect on the surface.

I. Concrete Temperatures: Minimum concrete temperature of fresh concrete varies in relation to average air temperature over a 24-hour period as follows:

1. Air temperature below 0°F Concrete temperature 70°F min.
2. Air temperature 0°F to 30°F Concrete temperature 65°F min.
3. Air temperature 30°F to 50°F Concrete temperature 50°F min.
4. Air temperature above 50°F No minimum temperature

The maximum temperature of concrete at the time of delivery shall be 90°F. When concrete temperature exceeds 90°F, concrete supplier shall attempt to reduce temperature by shading aggregates and cement and cooling mix water. When these methods fail to reduce concrete temperature below 90°F, supplier shall use ice in the water to reduce the concrete temperature.

PART 3 – EXECUTION

3.1 PREPARATION

A. Do not place concrete until data on materials and mix designs have been approved, Architect has been notified, and all other affected trades have coordinated their work.
B. Remove snow, ice, frost, water, mud, and other foreign material from surfaces, reinforcing bars and embedded items against which concrete will be placed.
C. Do not allow form release agent to contact reinforcing bars.

3.2 SLAB - Slab on Grade:

1. All interior slabs on grades shall have a 15 mil polyethylene vapor retarder conforming to ASTM E1745. Lap all joints minimum 6” and seal edges with adhesive tape. Fit vapor retarder around utilities and seal with adhesive tape as required. Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.
2. Refer to Drawings and Section 31 23 00 for required sub-grade preparation beneath slabs on grade.
3. Saw cut control joints: Cut with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Control joints shall be located along column lines, with intermediate joints spaced at a maximum distance of 36 times the slab thickness, unless noted otherwise. Control Joints shall be continuous, not staggered or offset. Slab panels shall have a maximum length to width ratio of 1.5 to 1. Provide additional control joints at all reentrant or isolated corners formed in the slab on grade.
4. Provide isolation joints around each column and along foundation walls. Form isolation joints with 1/2" expansion joint material. Extend isolation joint material full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
5. Depress slabs as required for mats architectural finishes and pits. Obtain layout and locations from Architect.
6. Verify completion of all under slab work with mechanical and electrical trades before placing slabs.
7. Slope slabs as indicated on Drawings and to provide positive drainage. Slope slab keeping bottom level and varying top. Maintain minimum thickness of concrete as indicated on Drawings. Refer to floor finishes for tolerances.
8. Provide mock-up of vapor retarder installation, no less than 400 s.f., to be approved by Architect.

3.3 CONSTRUCTION JOINTS

A. Horizontal: Locate horizontal joints in walls and piers at the top of slabs and footings unless otherwise indicated. At least 24 hours shall elapse between placing concrete in a wall and placing concrete in an area supported by the walls unless approved in writing by Structural Engineer.

B. Reinforcing: Stop all welded wire reinforcement and/or reinforcing at construction joint. Provide dowel bars as detailed. Key joints in walls, between walls and footings or slabs with longitudinal keys unless noted otherwise. Roughen and thoroughly clean the surface of the concrete, remove all laitance, and wet the surface before placing new concrete against the joint. Slush vertical joints with a neat cement grout before placing new concrete.

3.4 CONCRETE PLACEMEN

A. Place concrete as continuously as possible until placement is complete. Do not place against concrete that has attained initial set, except at authorized joints. If, for any reason, concrete pour is delayed for more than 45 minutes, bulkhead off pour with key at last acceptable construction joint. Immediately remove excess concrete and clean forms.

B. Do not begin to place concrete during periods of rain, sleet or snow unless adequate protection is provided.

C. No concrete shall be cast onto or against sub-grades containing free water, frost, ice or snow.

D. Notify the architect in advance if concrete is to be pumped.

E. Do not place concrete until all reinforcement is in place, forms have been thoroughly cleaned and approval has been given.

F. Do not accept concrete delivered to the job site more than 90 minutes after initial mixing.

G. Concrete from its point of release to mixers, hoppers, or conveyances, shall not be permitted to drop more than 5 feet. Deposit concrete directly into conveyances and directly from conveyances to final points of deposit. Sufficient transportation equipment in good working order shall be on hand before work begins. All conveying equipment must be clean and kept clean during concreting operations. Take every possible precaution to prevent segregation or loss of ingredients.

H. Deposit concrete in wall forms in layers not greater than 12 inches in depth, each layer being compacted by internal vibration before succeeding layer is placed.

I. Place concrete as near as possible to its final position to prevent segregation. Do not use vibrators to transport concrete within forms. Consolidate concrete in walls, columns, beams and slabs or joist construction thicker than 8" with internal vibrators (8,000 to 12,000 V.P.M.). Slabs less than 8" thick may be consolidated with internal vibrators (9,000 to 13,500 V.P.M.) or vibrating screeds supported on forms, boards or rails, approved by Structural Engineer, supplement vibration by forking or spading by hand along surfaces adjacent to forms and construction joints.

J. Re-tempering of concrete will not be permitted. Concrete that has obtained its initial set shall be discarded.

K. Exercise care in placing concrete over waterproof membranes, rigid insulation and/or protection boards to avoid damaging those materials. Report damage immediately, and do not proceed until damage is repaired.

L. Remove loose debris from surfaces, thoroughly wet and slush with a neat cement grout immediately before placing new concrete, or apply bonding compound to surface and let dry before placing new concrete.

M. Protect existing concrete work to be exposed to view and other finished materials from damage and staining resulting from concreting operations. Handle concrete carefully to avoid dripping and spillage. Remove spilled concrete from existing surfaces immediately.

Covering sills, ledges, and other surfaces with protective coverings may be necessary to protect the work.

N. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

O. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor rods for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.5 CONCRETE FINISHES AND TOLERANCES

Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.6 CONCRETE SLAB FINISHES AND TOLERANCES

A. Trowel Finish:
   1. Screed concrete to an even plane, float, then power trowel the surface.
   2. Hand trowel the surface smooth and free of trowel marks. Continue hand troweling until a ringing sound is produced as the floor is troweled.
   3. Provide trowel finish as indicated on the Drawings and at the following locations:
      i. Concrete floors exposed in finished work unless otherwise indicated.
      ii. Slabs to receive curing compounds and sealers.
      iii. Slabs to receive resilient flooring or carpet.

B. Fine Broom Finish:
   1. Screed concrete to an even plane, float, then power trowel the surface. Provide fine hair broom finish perpendicular to slope, free of loose particles, ridges, projections, voids and concrete droppings.
   2. Provide fine broom finish as indicated on the Drawings and at the following locations:
      i. Stoop slabs.
      ii. Raised curbs and walkway areas.
      iii. Slabs to receive thin set ceramic tile.

C. Broom Finish:
   1. Screed concrete to an even plane and then float. Immediately after concrete has received a floated finish, give the concrete surface a coarse transverse scored texture by drawing a coarse broom across the surface.
   2. Provide as indicated on the Drawings and at the following locations:
      i. ADA ramp slabs.
      ii. Exterior walkway slabs.

D. Floor Finish Tolerances: Floor finish tolerances shall be measured by placing a freestanding (unleveled) 10 foot straightedge anywhere on the slab and allowing it to rest upon two high spots within 72 hours after placement of slab and removal of shoring (if present). The gap at any point between the straightedge and the floor (and between the high spots) shall not exceed:
   1. Slab on Grade: 1/4”

E. Slab Drainage: Finish all concrete slabs to proper elevations to insure that all surface moisture will drain freely to floor drains, and that no puddle areas exist. Contractor shall bear the cost of corrections to provide positive drainage.

F. Special Tolerances for Concrete Slabs: No abrupt change in vertical elevation of 1/4" or more is acceptable at the interface between slabs and within areas where pedestrian traffic is expected:

3.7 CONCRETE CURING

A. Freshly placed concrete shall be protected from premature drying and excessively hot temperatures.

B. Concrete other than high-early strength shall be maintained above 50°F and in a moist condition for at least the first 7 days after placement, except when special curing is used. Special curing procedures shall not be used without written permission from the Structural Engineer of Record.

C. Formed surfaces shall be cured by leaving the formwork in place during the curing period.

D. Protect concrete from excessive changes in temperature during the curing period and at the termination of the curing process. Changes in the temperature of the concrete shall be as uniform as possible and shall not exceed 5°F in any one hour or 50°F in any 24 hour period.

E. Protect concrete from injury from the elements until full strength is developed. Protect from mechanical injury.

F. During cold weather construction, all footings shall be protected from frost penetration until the building is enclosed and temporary heat is provided.

3.7 SLAB CURING

A. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

B. Moisture-Retaining-Cover Curing: Cover concrete surface with waterproof sheet material as soon as finishing operations are complete and the concrete is sufficiently hard to be undamaged by covering. Sprinkle concrete with water as necessary during application of covering. Place in widest practicable width, with sides and ends lapped at least 6 inches, and seal with waterproof tape or adhesive. Weight down covering to prevent displacement. Immediately repair any holes or tears during the curing period using polyethylene sheet and waterproof tape. Curing process shall be maintained for a minimum of 7 days. Provide moist-retaining-cover curing at the following locations:
    1. Flat work placed and cured during hot weather, as defined in this specification.
    2. All slab on grade work placed directly on top of a vapor retarder or vapor barrier.

3.8 PENETRATING LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer’s written instructions.

B. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs in accordance with manufacturer’s written instructions.

C. Do not apply to concrete that is less than seven days old.

D. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.10 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

B. Do not fill joints until construction traffic has permanently ceased.

C. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave

contact faces of joint clean and dry.

D. Install semi-rigid joint filler in saw-cut joints and in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.11 APPLICATION OF FLOOR SEALER - FINISH COAT

A. Give concrete floors as indicated in Room Finish Schedule and where exposed in finished Work, second coat of curing and sealing compound immediately prior to Substantial Completion.

B. Clean floors and apply sealer strictly according to manufacturer's instructions. Dilution and coverage shall be as recommended by the manufacturer. Apply sealer evenly.

3.12 COLD WEATHER CONCRETING

A. Definition: Cold weather shall be defined as a period when for more than three successive days the average daily outdoor temperature drops below 40°F. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. When temperatures above 50°F occur during more than half of any 24 our duration, the period shall not be regarded as cold weather.

B. All cast-in-place concrete work occurring during cold weather shall conform to all requirements of ACI 306.1, “Standard Specification for Cold Weather Concreting”, published by the American Concrete Institute, Detroit, Michigan, except as modified by the contract documents or this specification.

C. Planning: The General Contractor, concrete contractor, concrete supplier and the architect shall have a pre-construction conference to outline the cold weather concreting operations concerning the placing, finishing, curing and protection of the concrete during cold weather. Pre-construction conference shall occur before cold weather is expected to occur.

D. Detailed procedure submittal: Concrete contractor shall prepare and submit for review detailed procedures for the production, transportation placement, protection, curing and temperature monitoring of concrete during cold weather. Include procedures to be implemented upon abrupt changes in weather conditions. Do not begin cold weather concreting until these procedures have been reviewed and approved.

E. Mixing: Concrete flatwork poured in cold weather shall be proportioned to obtain a lower slump to minimize the amount of bleed water during finishing. All bleed water should be skimmed off flatwork prior to troweling. Concrete that will be exposed to cycles of freezing and thawing while saturated should be properly air entrained as outlined in this specification.

F. Protection of Concrete: Cure and protect concrete against damage from freezing for a minimum period of 72 hours, unless approved by the structural engineer. The protection period may be reduced according to ACI 306.1 requirements. Concrete contractor shall submit a letter of request to reduce the protection period, by outlining the method used to achieve the reduction per ACI 306.1.

1. When practical for the construction schedule, formwork shall be insulated and remain in place for at least the required protection period.

G. Concrete Temperatures: The minimum temperature of concrete immediately after placement shall be as specified in the following table.

    1. Section Size <12”
        - Minimum temperature of concrete as placed and maintained during the protection period: 55 degrees
        - Maximum gradual decrease in surface temperature during any 24 hours after the end of the protection: 50 degrees

- Mixing Temperatures
    - Above 30 degrees – 60 degrees
    - 0 to 30 degrees – 65 degrees
    - Below 0 degrees - 70 degrees

2. Section Size: 12-36”
    - Minimum temperature of concrete as placed and maintained during the protection period: 50 degrees
    - Maximum gradual decrease in surface temperature during any 24 hours after the end of the protection: - 40 degrees
    - Mixing Temperatures
        - Above 30 degrees - 55 degrees
        - 0 to 30 degrees - 60 degrees
        - Below 0 degrees - 65 degrees
3. Section Size: 36-72”
    - Minimum temperature of concrete as placed and maintained during the protection period: 50 degrees
    - Maximum gradual decrease in surface temperature during any 24 hours after the end of the protection: 30 degrees
    - Mixing Temperatures
        - Above 30 degrees - 50 degrees
        - 0 to 30 degrees - 55 degrees
        - Below 0 degrees - 60 degrees
4. Section Size: >72”
    - Minimum temperature of concrete as placed and maintained during the protection period: 50 degrees
    - Maximum gradual decrease in surface temperature during any 24 hours after the end of the protection: 20 degrees
    - Mixing Temperatures
        - Above 30 degrees - 45 degrees
        - 0 to 30 degrees - 50 degrees
        - Below 0 degrees - 55 degrees

H. Mixing Temperatures: As the ambient air temperature decreases the concrete mixing temperature shall be increased to compensate for the heat lost in the period between mixing and placement. The concrete supplier shall use one or both of the following methods for increasing the concrete temperature.
    1. Heating the mixing water to a temperature necessary to offset the temperature losses during transport. Supplier shall not heat water to temperatures in excess of 140°F, without taking special precautions as outlined in ACI 306.
    2. Heating the aggregate with a circulated steam piping system.

I. Temperature measurements: The Contractor shall be responsible for monitoring and recording the concrete temperatures during placement and throughout the protection period.
    1. Inspection personnel shall keep a record of the date, time, outside air temperature, temperature of concrete as placed, and weather conditions.
    2. Temperature of the concrete and the outside air shall be recorded at regular intervals but not less than twice in a 24 hour period. The record shall include temperatures at several points within the enclosure and on the concrete surface of sufficient frequency to determine a range of temperatures.
    3. Inspection agency shall submit the temperature logs to the Architect for permanent job records.

3.13 HOT WEATHER PROTECTION

A. Definition: Hot weather shall be defined as any combination of high ambient temperature, low relative humidity, high winds and intense solar radiation that leads to higher than usual evaporation. The table below defines low relative humidity based on air temperature. For a given air temperature, if the relative humidity is equal to or less than the specified minimum, provisions for hot weather concreting shall be as follows:
    a. Air Temperature Minimum Relative Humidity:
        - 105°F - 90%
        - 100°F - 80%
        - 95°F - 70%
        - 90°F 60%
        - 85°F 50%
        - 80°F 40%
        - 75°F 30%
B. Scheduling: When hot weather is expected, adjust concrete placement schedules to avoid placing or finishing during the period from noon until 3:00 pm. When possible, slab pours should be delayed until the building is enclosed to protect the concrete from wind and direct sunlight, Construction schedule shall account for 7 day moist curing period.
C. Mixing: Concrete supplier shall adjust mix designs and admixtures to minimize slump loss. Concrete shall be mixed at a water-cement, which is lower than the specified maximum to allow for the adjustment of slump by addition of water in the field. Water reduction shall be accomplished without reducing initial slump by increasing dosage of water reducing admixture.
D. Preparation: Do not order concrete earlier than is required to avoid delays. Cool forms, subgrades and reinforcing bars with water spray from fog nozzle prior to concrete placement.
E. Delivery: Site traffic shall be coordinated and delivery times scheduled to minimize waiting times for concrete trucks.
F. placement: Preparations shall be made to place and consolidate the concrete at the fastest possible rate. Maintain a continuous flow of concrete to the job site to avoid development of cold joints, during placement of slabs, apply fog spray to prevent moisture loss without causing surplus water to stand on concrete surface.
G. Finishing: Finish concrete as fast as practical. Continue fogging concrete during finishing. Where fogging is not possible, apply sprayable moisture-retaining film between finishing passes.
H. Curing: Formed concrete shall be covered with a waterproof material to retain moisture.
I. Flat work shall be moisture cured as described in this specification. Moist curing shall continue for at least 7 days.

3.13 FIELD QUALITY ASSURANCE

A. Independent Testing Agency and Special Inspector shall each perform their prescribed inspection, sampling, and testing services as described in Part 1 of this specification section.
B. In cases where samples have not been taken or tests conducted as specified or strength of laboratory test cylinders for a particular portion of the structure fails to meet requirements of ACI 301, for evaluation of concrete strength, Structural Engineer shall have the right to order compressive or flexural test specimens or both be taken from the hardened concrete according to ASTM C42, load tests according to ACI 318, or such other tests as may be necessary to clearly establish the strength of the in situ concrete, and such tests shall be paid for by the Contractor.

3.14 REPAIR OF DEFECTIVE AREAS

A. All repair of defective areas shall be made, with prior approval of Architect, as to method and procedure, in accordance with Chapter 9 of ACI 301, except specified bonding compound must be used.
B. All structural repairs shall be made, with prior approval of the Architect/Engineer, as to method and procedure, using the specified epoxy adhesive and/or epoxy mortar.
C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
    a. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface. In depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
    b. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
    1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch
    2. After concrete has cured at least 14 days, correct high areas by grinding. wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
    3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
    4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
    5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch
    6. Repair defective areas, except random cracks and single holes to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch
    7. Repair random cracks and single holes clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete. 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent

has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

3.16 CLEANING
A. Clean exposed concrete to remove laitance, efflorescence and stains.

END OF SECTION 03 30 00

SECTION 04 20 00 – UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units.

B. See Division 05 Section "Metal Fabrications" for furnishing steel lintels and shelf angles installed in unit masonry assemblies.

1.2 SUBMITTALS

A. Product Data: For each masonry unit, accessory, and other manufactured product indicated.

B. Shop Drawings: For masonry reinforcing bars; comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

C. Material Test Reports: For each type of masonry unit, mortar, and grout required.

1.3 QUALITY ASSURANCE

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner or as authorized by Change Order. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength.

B. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

1.4 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

B. Hot-Weather Requirements: When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 MASONRY UNITS

A. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: 1900-psi- minimum, average net-area compressive strength.
2. Weight Classification: Normal weight.
3. Special Shapes: Provide for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

B. Concrete Building Brick: ASTM C 55.

1. Unit Compressive Strength: 3500-psi- minimum, average net-area compressive strength.
2. Weight Classification: Normal weight.

2.2 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

D. Aggregate for Grout: ASTM C 404.

E. Cold-Weather Admixture: Not allowed.

F. Water: Potable.

2.3 REINFORCING

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60.

B. Masonry Joint Reinforcement: ASTM A 951; mill galvanized, carbon-steel wire for interior walls and hot-dip galvanized, carbon-steel wire for exterior walls.

1. Wire Size for Side Rods: W1.7 or 0.148-inch diameter for 1/4 to 3/8 inch joints W2.8 or 0.188-inch diameter for 3/8 to 1/2 inch joints.
2. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter for 1/4 to 3/8 inch joints. W2.8 or 0.188-inch diameter for 3/8 to 1/2 inch joints.

3. Single-Wythe Masonry: Use either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches o.c.

2.4 TIES AND ANCHORS

A. Materials, General: As follows, unless otherwise indicated:

1. Galvanized Steel Sheet: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153, at exterior walls; and ASTM A 653/A 653M, G60, commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication at interior walls.
2. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating for exterior walls and Class 1 coating for interior walls.

B. Anchors for Connection to Existing Structure: Provide units fabricated from sheet metal anchor sections and heavy wire connectors that allow for longitudinal movement while resisting lateral forces perpendicular to the wall.

1. Anchor Sections: Formed from 0.036-inch- thick, hot-dip galvanized steel sheet with screw holes and integral edge sleeves designed to receive connector wires.
2. Connectors: 0.1677-inch- diameter, hot-dip galvanized steel wire.
3. Product: Dayton Superior Corporation, Dur-O-Wal Division; DA2200 Joint Stabilization Anchor.
4. Locations: Use where masonry walls

2.5 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from urethane or PVC.

B. Preformed Control-Joint Gaskets: Designed to fit standard sash block and to maintain lateral stability in masonry wall. Made from styrene-butadiene-rubber compound complying with ASTM D 2000, Designation M2AA-805.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.6 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.

2.7 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, unless otherwise indicated. Do not use calcium chloride in mortar or grout.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.

1. Limit cementitious materials in mortar to portland cement and lime.
2. For masonry below grade, in contact with earth, and where indicated, use Type M.
3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for exterior veneer walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

C. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

2.8 SOURCE QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below. Payment for these services will be made from the Inspection and Testing Allowance, as authorized by Change Orders.

B. Retesting of materials failing to comply with specified requirements shall be performed at Contractor's expense.

C. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cut masonry units with motor-driven saws. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

C. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
2. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.

3.2 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets.

Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Lay exposed masonry in running bond pattern, unless otherwise indicated; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

D. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.3 MORTAR BEDDING AND JOINTING

A. Lay hollow masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.

3.4 MASONRY JOINT REINFORCEMENT

A. Provide continuous masonry joint reinforcement as indicated. Install with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

B. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections.

3.5 ANCHORING MASONRY

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to existing construction.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically.

3.6 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry to provide an unbroken vertical separation through all single wythe masonry walls, at locations indicated. Where locations are not shown, construct control joints throughout the unbroken length of walls at approximately 25' 0" centers. Also, place control joints at points of natural weakness in the masonry work, including the following locations:

1. Above and below major openings, at one jamb if opening is less than 6'-0" wide and at both jambs if opening is over 6'-0" wide.
2. At vertical chases, recesses and other points of reduction in wall thickness.
3. At locations where masonry wall height changes by more than 20 percent.
4. Above expansion, construction or control joints in the supporting structure.
5. Where end of masonry wall butts against supporting structure.
6. At return angles in “L”, “T”, and “U” shaped intersections.

B. Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

C. Form control joints in concrete masonry as follows:

1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.

3.7 LINTELS

A. Provide masonry lintels where shown. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated.

B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.8 CLEANING

A. Clean unit masonry by dry brushing to remove mortar fins and smears before tooling joints, as work progresses.

B. After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

END OF SECTION 04 20 00
04810/11-99/bac

SECTION 05 50 00 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes metal fabrications.

1.2 ACTION SUBMITTALS

A. Product Data: Submit product data for the following:

1. Paint products.
2. Grout.

B. Shop Drawings: Submit shop drawings detailing the fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1. For installed products indicated to comply with design loads, include structural analysis data, for information only, signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Welding Certificates: Copies of certificates for welding procedures and personnel.

B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project for a minimum of 5 years, with a record of successful in-service performance, with sufficient production capacity to produce required units without causing delay in the work.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal fabrications that are similar to those indicated for this Project in material, design, and extent.

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Sample Installation:

1. Following review of samples, construct sample installation of the following:

   a. Countertop and vanity.

2. The sample installation shall be complete with all anchors, jointing, plywood, finished countertop surfacing, lavatory bowls and supports, as shown in accordance with the final shop drawings. Sample installations shall be reviewed by the Architect for acceptance of workmanship only. Replace unsatisfactory work as directed for final acceptance. Maintain sample installations during construction as a standard for judging acceptability of countertop work. Properly finished and maintained sample installation may be retained as a portion of the completed work.

1.5 STORAGE, DELIVERY AND HANDLING

A. Store metal fabrications in a dry, well-ventilated, weathertight place. Deliver and handle so as to prevent any type of damage to the fabricated work.

1.6 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Counter Tops and Vanities: Provide countertop and vanity framing capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections, or of exhibiting excessive deflections in any of the components making up the countertops and vanities:

   a. All deadloads.
   b. 500 pound live load placed on the countertop and vanity.
   c. Deflection at Midspan: L/1000 times span or 1/8" whichever is less.
2. Brick shelf angle deflection shall be sized and anchored to carry the imposed loads such that total deflection is limited to the lesser of 1/600 or 0.3 inch and rotations are less than 1/16 inch. Size angle so that at least 2/3 of brick thickness is supported.
3. Overhead Coiling Grilles,: Fabricate and install support framing capable of supporting all deadloads and withstanding live loads imposed from functioning operations.

B. Exterior Metal Fabrications: All exterior metal fabrications shall be fabricated and installed to prevent buckling, opening up of joints and overstressing of welds and fasteners under the following temperature conditions:

1. Base fabrication on a temperature of +70 deg F at time of installation with allowance made for an exposed metal surface temperature range of -5 deg F to +180 deg F. Make all necessary adjustments and provisions for concealed expansion.

2.2 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.3 FERROUS METALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

E. Cold Finished Steel Bars: ASTM A108, grade as selected by fabricator.

F. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

G. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

H. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500, or hot formed steel tubing complying with ASTM A 501.

I. Steel Pipe: ASTM A 53, standard weight (Schedule 40) minimum, unless otherwise indicated or required to satisfy the performance requirements; finish as follows:

1. Black finish, unless otherwise indicated.
2. Galvanized finish for exterior installations and where indicated.

J. Cast-in-Place Anchors in Concrete: Anchor channel type, with filler strips, manufactured from formed hot or cold rolled carbon steel channels with flange edges returned toward web, having a minimum of 2 stud, or I, anchors shop welded to the back of each channel, complying with ASTM A 570. Provide channels, bolts, washers, and shims hot-dip galvanized per ASTM A 153/A 153M. Width, depth, and metal thickness as required to suit performance requirements.

K. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

L. Steel Bars for Gratings: ASTM A 36/A 36M.

M. Wire Rod for Grating Crossbars: ASTM A 510 (ASTM A 510M).

2.4 ALUMINUM

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T6.

B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, alloy 6061-T6.

2.5 PAINT

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Shop Primer for Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Carboline 621; Carboline Company.
b. Aquapon Zinc-Rich Primer 97-670; PPG Industries, Inc.
c. Tneme-Zinc 90-97; Tnemec Company, Inc.

D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.6 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

D. Eyebolts: ASTM A 489.

E. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

G. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

H. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).

I. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).

J. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Interior Expansion Anchor Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Exterior Expansion Anchor Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

K. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.7 GROUT

A. Non-shrink, Non-metallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.8 CONCRETE FILL

A. Concrete Materials and Properties: Composed of ASTM C150 Type I Portland cement, ASTM C33 sand and coarse aggregates and potable water to produce a low slump mix suitable for placement. Grade coarse aggregate from 1/8 inch with at least 95 percent passing a 3/8 inch sieve and not more than 10 percent passing a No. 8 sieve. Fill shall be proportioned to provide a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.9 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

1. Welded connections may be used where bolted connections are shown.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Weld corners and seams continuously along entire line of contact to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices and fasteners to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

I. Remove sharp or rough areas on exposed traffic surfaces.

J. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head

(countersunk) screws or bolts. Locate joints where least conspicuous. Make up threaded connections tight so that threads are entirely concealed.

K. Hot-dip galvanize all exterior ferrous metal fabrications embedded in concrete. Hot-dip galvanize all other items where specified or shown.

1. Exterior ferrous metal fabrications are defined as those items which are indicated to be installed in areas exposed to conditions which are not controlled by the building heating and cooling systems.
2. Interior ferrous metal fabrications are defined as those items which are indicated to be installed in areas exposed to conditions which are controlled by the building heating and cooling systems.

2.10 LOOSE STEEL LINTELS

A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches (200 mm), unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls. Prime paint loose steel lintels located in interior walls.

2.11 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide machined horizontally slotted holes to receive 3/4 inch (19 mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.

B. Provide joint gaps in angles where control and expansion joints in exterior cladding skin are shown or required. Size joint gaps to match width of the masonry joints in the location of use. Provide joints in other locations, as required for fabrication only, with tight joints.

1. Provide units at corners and other transitions fabricated into one piece.

C. Galvanize shelf angles to be installed in exterior walls; prime paint shelf angles to be installed in interior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.12 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports indicated and as necessary to complete the Work and which are not a part of the structural framework, including but not limited to framing and

supports for overhead rolling doors and grilles, countertop and vanities, CMU partition head supports, and mechanical and electrical equipment.

B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

C. Countertop and Vanity Framing: Custom fabricate countertop and vanity framing, using steel shapes and plates, and cold finished mild steel bars at exposed conditions, for support framing and plywood, to the thicknesses, sizes and shapes shown, and as required to produce work of adequate strength and durability, without objectionable deflections. Use proven details of fabrication, as required, to achieve proper assembly and alignment of the various components of the work.

D. CMU Partition Head Supports: Fabricate supports from 4 inch by 4 inch by 1/4 inch by 36 inch long structural steel angles. Drill supports a maximum of 12 inches o.c. to receive expansion bolts.

E. Galvanize miscellaneous framing and supports at exterior locations; prime paint miscellaneous framing and supports at interior locations.

2.13 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.

C. Surface Applied Corner Guards: Provide corner guards fabricated from angles of sizes shown, or if not shown, of minimum 4-1/2 inch by 4-1/2 inch by 1/4 inch thick equal leg angles. Drill and countersink legs of angles, for fastening to substrates indicated, with holes spaced 24 inches on center. Provide corner guard lengths of 42 inches, if not otherwise indicated.

D. Cast-In-Corner Guards: Provide corner guards fabricated from angles of size as shown, or if not shown, of minimum 4-1/2 inch by 4-1/2 inch by 1/4 inch thick equal leg angles. Fabricate each angle with welded-on stud anchors spaced 24 inches on center. Provide corner guard lengths of 42 inches, if not otherwise indicated.

E. Cast-In Pit Angles and Edge Angles: Provide edge angles, and pit angles, fabricated from angles of size as shown, or required, with welded-on stud anchors spaced 24 inches on center. Provide pit and edge angles in as long lengths as possible. Miter and weld corners and provide splice plates for alignment between sections.

F. Galvanize exterior miscellaneous steel trim; prime paint interior miscellaneous steel trim.

2.14 STRUCTURAL-STEEL DOOR FRAMES

A. Fabricate steel door frames from structural shapes and bars of size and to dimensions indicated, fully welded together, with 5/8 by 1-1/2 inch (16 by 38 mm) steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than 10 inches (250 mm) o.c. Reinforce frames and drill and tap as necessary to accept finish hardware.

B. Provide steel strap anchors, 1/8 by 2 inches (3 by 50 mm), with a minimum 6 inch (150 mm) embedment and 2 inch (50 mm) hook, unless otherwise indicated, for securing door frames into adjoining concrete or masonry. Weld anchors to frame jambs no more than 12 inches (300 mm) from both bottom and head of frame, and space anchors not more than 30 inches (750 mm) apart.

C. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

D. Galvanize exterior frames; prime paint interior frames.

2.15 PIPE BOLLARDS

A. Fabricate pipe bollards from Schedule 40 steel pipe.

B. Fabricate pipe bollards from Schedule 80 steel pipe.

1. Cap bollards with 1/4 inch (6 mm) minimum steel plate.

C. Fabricate bollards with 3/8 inch (10 mm) thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4 inch (19 mm) anchor bolts.

1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

D. Fabricate sleeves for bollard anchorage from steel pipe with 1/4 inch (6 mm) thick steel plate welded to bottom of sleeve.

E. Fabricate internal sleeves for removable bollards from Schedule 40 steel pipe or 1/4 inch (6 mm) wall-thickness steel tubing with an OD 1/16 inch (1.5 mm) less than ID of bollards. Match drill sleeve and bollard for 1/2 inch (12 mm) steel machine bolt.

F. Galvanize bollards after fabrication.

2.16 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.17 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces by removing oil, grease, and similar contaminants in accordance with SSPC -SP 1 "Solvent Cleaning," followed with the SSPC surface-preparation specifications listed below and environmental exposure conditions of installed metal fabrications. Surface preparation shall be done after fabrication and immediately prior to shop painting. Apply shop coat of paint within 4 hours after cleaning and before rust bloom occurs.

1. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Apply a minimum of one coat of shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be field welded, and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Dry Film Thickness of Primer: 2.5 to 3.0 mils, dry film thickness. Apply paint thoroughly and evenly to dry surfaces, free from holidays and pinholes, in accordance with manufacturer's directions.

2.18 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Polish: No. 4 finish.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.19 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors. Drill holes for bolts to the exact diameter of the bolt. Provide screws threaded full length to the screw head.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 SETTING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use non-shrink grout, either metallic or non-metallic, in concealed locations where not exposed to moisture; use non-shrink, non-metallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. CMU Partition Head Supports: Unless otherwise indicated place partition head supports on alternate faces of CMU partitions every 6'-0" o.c. and expansion bolt to underside of structure. Do not bolt to CMU partitions.

3.4 INSTALLING PIPE BOLLARDS

A. Anchor bollards to existing construction with post-installed anchors and bolts. Provide four 3/4 inch (19 mm) anchors at each bollard, unless otherwise indicated. Embed anchors at least 4 inches (100 mm) in existing concrete.

B. Fill bollards solidly with concrete, mounding top surface.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0 mil (0.05 mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 Section "Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pipe and tube handrails and railings.

1.2 ACTION SUBMITTALS

A. Product Data: Submit product data for handrails and railings, grout, anchoring cement, and paint products.

B. Shop Drawings: Submit shop drawings including plans, elevations, sections, details of installation, attachments to other Work.

1. For installed handrails and railings indicated to comply with performance requirements, include structural analysis data, for information only, signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples: Submit samples each exposed finish required including mechanical finishes on stainless steel.

1.3 INFORMATIONAL SUBMITTALS

A. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: A firm experienced in producing handrails and railings similar to those indicated for this Project for a minimum of 5 years, with a record of successful in-service performance, with sufficient production capacity to produce required units without causing delay in the work.

1. Employ only experienced tradesmen for both fabrication and installation, who are capable of producing work of the highest standards of quality in the industry.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of handrails and railings that are similar to those indicated for this Project in material, design, and extent.

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

2. AWS D1.3, "Structural Welding Code--Sheet Steel."
3. AWS D1.6, “Structural welding Code –Stainless Steel”.
4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 STORAGE, DELIVERY AND HANDLING

A. Store handrails and railings in a dry, well-ventilated, weathertight place. Deliver and handle so as to prevent any type of damage to the fabricated work.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance of Handrails and Railings:
1. Capable of withstanding the following performance requirements without exceeding the allowable design working stress of materials involved or local code whichever is greater:

a. Top Rail of Guards: Concentrated load of 200 lbf (890 N) applied at any point and in any direction, and a uniform load of 50 lbf/ft. (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf/ft. (1460 N/m) applied vertically downward. Concentrated and uniform loads need not be assumed to act concurrently.
b. Handrails Not Serving as Top Rails: Concentrated load of 200 lbf (890 N) applied at any point and in any direction, and a uniform load of 50 lbf/ft. (730 N/m) applied in any direction. Concentrated and uniform loads need not be assumed to act concurrently.
c. Infill Area of Guards: Horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area. Load on infill area need not be assumed to act concurrently with loads on top rails.

B. Regulatory Requirements: Comply with the requirements of Part 1910 of the Occupational Safety and Health Standards (OSHA), the American Disabilities Act (ADA), and local regulatory requirements as applicable to stairs, handrails and the protection of openings; where regulatory requirements conflict the more stringent shall apply.

2.2 METALS

A. Steel and Iron:

1. Steel Pipe: ASTM A 53, Type S – Seamless, Grade A suitable for close coiling or cold bending, standard weight (Schedule 40) minimum, unless otherwise indicated or required to satisfy performance requirements, black finish.
2. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless otherwise indicated or required to satisfy the performance requirements.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
4. Cold Finished Steel Bars: ASTM A108, grade as selected by fabricator.
5. Iron Castings: Malleable iron complying with ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010) or gray iron complying with ASTM A 48, Class 30 (ASTM A 48M, Class 200).

B. STAINLESS STELL
1. Tubing: ASTM A 554, Grade MT 304.
2. Pipe: ASTM A312/A 312M, Grade TP 304.
3. Casting ASTM A743/A S43M, grade CF 8 or CF 20.
4. Plate and Sheet: Astm A 240/A 240M or ASTM A 666, Type 304.

C. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

2.3 MISCELLANEOUS MATERIALS

A. Welding Electrodes and Filler Metal: Provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners: Same basic metal as fastened metal; concealed, unless otherwise indicated or unavoidable, and standard with systems indicated.

C. Anchors: Fabricated from materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined per ASTM E 488.

D. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; with good resistance to corrosion; and compatible with finish paint systems indicated.

E. Shop Prime for Galvanized Steel: Vinyl wash primer complying with MPI#80 or Water based galvanized metal primer complying with MPI#134.

F. Grout and Anchoring Cement: Premixed, non-shrink, non-metallic grout complying with ASTM C 1107 or erosion-resistant, non-shrink, anchoring cement; recommended by manufacturer for use indicated.

G. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 FABRICATION

A. General: Fabricate to design, dimensions, and details indicated, but not less than that required to comply with the performance requirements.

B. Form changes in direction of railing members by bending.

C. Form curves by bending in jigs to produce uniform curvature without buckling, twisting, cracking, or otherwise deforming exposed surfaces.

D. Welded Connections: Connect handrail and railing members by welding. Cope and weld or use welded-in fittings. Weld connections continuously. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

E. Brackets, Flanges, Fittings, and Anchors: Fabricate wall brackets, flanges, miscellaneous fittings, and anchors to connect handrails and railings to other work.

1. Cast or form metal of same material and finish as rails.

F. Close exposed ends of handrail and railing members with prefabricated end fittings.

G. Provide wall returns at ends of wall-mounted handrails.

2.5 FINISHES

A. Shop-Primed Steel Finish: Prepare uncoated ferrous-metal surfaces by removing oil, grease, and similar contaminants in accordance with SSPC -SP 1 "Solvent Cleaning," followed with SSPC-SP 7, "Brush-off Blast Cleaning."

B. Apply a minimum of one coat of shop primer to uncoated surfaces of pipe and tube railings, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

C. Galvanized Railings:
1. Hot-dip galvanized exterior steel and iron railings including hardware, after fabrication.
2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.

D. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

E. Do not deliver primed pipe and tube railing work until primer has dried.

F. Stainless Steel Finish:

1. Remove tool and die marks and stretch lines, or blend into finish.
2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches.
3. Run grain with long dimension of each piece.
4. Directional Satin finish No. 4.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Perform cutting, drilling, and fitting required to install handrails and railings. Set units accurately in location, alignment, and elevation.

1. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
2. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

B. Anchor posts in concrete by inserting into core-drilled holes and grouting annular space.

C. Anchor posts to metal surfaces with oval flanges.

D. Anchor railing ends into concrete and masonry with round flanges connected with post-installed anchors and bolts.

E. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2 inch (38 mm) clearance from inside face of handrail and finished wall surface.

1. For steel-framed gypsum board assemblies, fasten to steel framing or concealed reinforcements using self-tapping screws of size and type required to comply with the performance requirements.

F. Touch up surfaces and finishes after erection. Clean field welds, bolted connections, and abraded areas and touch up paint with the same material as used for shop painting.

G. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

H. Galvanized Surfaces: clean field welds, bolted connections, and abraded and repair galvanizing to comply with ASTM A 780.

I. Protect finishes of railing form damage during construction period with temporary protective coverings. Remove protective coverings at time of Substantial Completion.

END OF SECTION 05 52 13
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SECTION 06 10 53 – MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Miscellaneous lumber.
   2. Panel products for equipment backing panels.
   3. Wood blocking, cants and nailers.
   4. Accessories necessary for a complete instillation.

1.2 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product indicated.

   1. Include data for wood-preservative and fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that materials comply with requirements.

B. Research/Evaluation Reports: For the following:

   1. Preservative-treated wood.
   2. Fire-retardant-treated wood.
   3. Power-driven fasteners.

1.3 QUALITY ASSURANCE

A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

   1. Dimension lumber.
   2. Miscellaneous lumber.
   3. Plywood.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Provide dressed lumber, S4S, unless otherwise indicated.

3. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches above grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use Interior Type A High Temperature (HT), unless otherwise indicated.

2.4 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.
4. Grounds.
5. Shims.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Eastern softwoods, No. 2 Common grade; NELMA.
3. Northern species, No. 2 Common grade; NLGA.

2.5 PANEL PRODUCTS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

2.6 FASTENERS

A. General: Where carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

1. Use Type 304 stainless steel fasteners at wood blocking at copings, roof edges, and where indicated within other roofing assemblies.

B. Power-Driven Fasteners: CABO NER-272.

C. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.

C. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.

END OF SECTION 06 10 53
06105/11-99/dub

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cement board soffit sheathing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory.".

2.2 SOFFIT SHEATHING

A. Cementitious Exterior Backer Units: ASTM C 1325, Type A, thickness 5/8 inch.

2.3 FASTENERS

A. Screws for Fastening Sheathing to Cold-Formed Metal Framing: Wafer head or hard-roc steel drill screws complying with ASTM C 954. Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with all requirements of the local Code.

D. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

END OF SECTION 06 16 00

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior standing window frames and trim.
2. Plastic-laminate cabinets.
3. Plastic-laminate countertops.
4. Solid-surfacing-material countertops.
5. Closet and utility shelving.

B. Related Sections include the following:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size and elevation at not less than ½” = 1’-0”.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures faucets soap dispensers and other items installed in architectural woodwork.

C. Samples:

1. Lumber and panel products with shop-applied opaque finish, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels, for each finish system and color, with 1/2 of exposed surface finished.
2. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
3. Thermoset decorative-panels, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with edge banding on 1 edge.
4. Solid-surfacing materials, 6 inches (150 mm) square.
5. Corner pieces as follows:

    a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
    b. Miter joints for standing trim.

6. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Product Certificates: For each type of product, signed by product manufacturer.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products Certified participant in AWI's Quality Certification Program and maintain an organized quality control program and retains facilities with sufficient capacity and quality to produce the required architectural woodwork without causing delay to the project..

C. Source Limitations: Engage a qualified woodworking firm with 15 years successful experience in custom fabrication and installation of architectural woodwork comparable to that shown and specified, be a member of the AWI, and acceptable to the Architect, to assume undivided responsibility for production and installation of interior architectural woodwork .

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or,

where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species for Opaque Finish: Any closed-grain hardwood or HDF.

C. Wood Products: Comply with the following:
1. Low-Emitting Materials: Composite wood products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2. Hardboard: AHA A135.4.
3. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
4. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
5. Softwood Plywood: DOC PS 1, Medium Density Overlay.
6. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

D. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

F. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. SileStone by Cosentino.

2. Colors and Patterns: As indicated in the Finish Schedule on the drawings..

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.

1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use the following treatment type:
1. Interior Type A: Low-hygroscopic formulation.
2. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking plant certified by testing and inspecting agency.
3. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

4. Kiln-dry materials before and after treatment to levels required for untreated materials.

C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.

C. Pulls: Back mounted, solid metal, stile and manufacturer as noted on the drawings.

D. Catches: Magnetic catches, BHMA A156.9, B03141for single doors and B03161 for double doors.
1. Single doors
   a. CD41 Single Magnetic Cabinet Catch: Stanley Commercial hardware.
2. Double doors
   a. 901 Rockwood Manufacturing Company.
   b. CD45 double Magnetic Cabinet Catch; Stanley Commercial Hardware.

E. Cabinet Shelf Rests: BHMA A156.9, BO4013; metal two pin type with shelf hold-down clip. Hafele 282.01.0701 x282.50.704 nickel plated 7 mm diameter shelf support pegs in brass ssockets.

F. Closet Rods and flanges:
1. For spans up to 48 inchs: No. KV 770-1 rod with 735 flanges by Knape and Vogt.
2. For spans from 48 inches up to 84 inches: No. KV 770-5 rod with 766 flanges by Knape and Vogt.

G. Adjustable Shelf Standards and Supports:
1. Standards: Model No. 87ANO Extra Heavy Duty 87-187 Sseries; length as indicated, by Knap and Vogt.
2. Brackets:
   a. Model No.186LL ANO for 8 and 10 inch deep shelves by Knap and Vogt..
   b. Model No.187 LL ANO for 12 to 24 inch deep shelves by Knap and Vogt.

H. Shelf Rests: Model No. 210 ANO End rest and Model No. 211 ANO Center Rest with Model No. 129 RUB Cutions by Knap and Vogt.

I. Drawer Slides: BHMA A156.9, B05091.

1. Drawers: Similar to Accuride 4032 have full extension full extension carburized steel ball bearing, rail mounting, 150 lb. Capacity heavy duty load rating, cold rolled steel slide members and ball retainers, cushioned in and out stops, detent-in, progressive action, positive stop, bright electro zinc plated finish.
2. Refuse Cabinets: Similar to Accuride 3600-201 having full extension carburized steel ball bearing, bottom mounting, 175 lb. Capacity heavy duty load rating, cold rolled steel slide members and ball retainer, cushioned in and out stops, progressive action, positive stop, bright electro zinc plated finish.

J. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Product: Subject to compliance with requirements, provide "MM series" by Doug Mockett & Company, Inc.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Finish as indicated in drawings or, if not indicated, as directed by Architect.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

C. Adhesives, General: Adhesives shall not contain urea formaldehyde.

D. Low-Emitting Materials: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1/16 inch (1.5 mm).
2. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).
3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch (1.5 mm).

E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

2.6 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

A. Grade: Premium.

B. Wood Species: Any closed-grain hardwood.

C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

D. Assemble casings in plant except where limitations of access to place of installation require field assembly.

E. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

2.7 PLASTIC-LAMINATE CABINETS

A. Grade: Custom.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Reveal Dimension: 1/2 inch (13 mm).

D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade VGS.
4. Edges: Grade HGS.

E. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.

2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

F. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

G. Colors, Patterns, and Finishes: As indicated on the drawings and in the Finish Schedule.

H. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.8 PLASTIC-LAMINATE COUNTERTOPS

A. Grade: Custom.

B. High-Pressure Decorative Laminate Grade: HGS.

C. Colors, Patterns, and Finishes: As indicated on the drawings and in the Finish Schedule.

D. Edge Treatment: Same as laminate cladding on horizontal surfaces.

E. Core Material: Particleboard Medium-density fiberboard or Particleboard made with exterior glue or exterior grade plywood.

F. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

2.9 SOLID-SURFACING-MATERIAL COUNTERTOPS

A. Grade: Custom.

B. Solid-Surfacing-Material Thickness: 3/4 inch (19 mm).

C. Colors, Patterns, and Finishes: As indicated on the drawings and in the finish Schedule.

D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing. Adhesive stains will not be permitted.

1. Fabricate tops with shop-applied edges of materials and configuration indicated.
2. Fabricate tops with shop-applied backsplashes.

E. Install integral sink bowls in countertops in shop.

F. Factory drill holes in countertops for scheduled plumbing fittings and soap dispensers in shop.

2.10 CLOSET AND UTILITY SHELVING

A. Grade: Custom.

B. Shelf Material: 3/4-inch (19-mm) veneer-faced panel product with veneer edge banding.

C. Cleats: 3/4-inch (19-mm) solid lumber.

2.11 SHOP FINISHING

A. General: Drawings indicate items that are required to be shop finished. Finish such items at fabrication shop as specified in this Section. Refer to Division 09 painting Sections for finishing architectural woodwork not indicated to be shop finished.

B. Finishing Materials: Products shall comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Priming: Shop apply the prime coat including backpriming, if any, for items specified to be field finished. Refer to Division 09 painting Sections for material and application requirements.

D. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches (2400 mm) long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.

1. Fill gaps, if any, between top of trim and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).

H. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets without sag, bow, or other variation from a straight line.

2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or hanging strips.

I. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops without sag, bow, or other variation from a straight line.
3. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
4. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

J. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

K. Refer to Division 09 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer, that ensures that woodwork will be without damages or deterioration at time of Substantial Completion.

END OF SECTION 06 40 23

SECTION 07 21 00 – THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation under slabs.
2. Concealed building insulation.
3. Vapor retarders.

1.2 ACTION SUBMITTALS

A. Product Data: For each product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research/evaluation reports.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics and other methods indicated with product, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

B. Insulation to be formaldehyde free.

PART 2 - PRODUCTS

2.1 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards and, for preformed units, in sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.
1. See drawings for insulation thickness or R value.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.60 lbs./cu. ft. (26 kg/cu. m) and Type VII, 2.20 lbs./cu. ft. (35 kg/cu. m), with maximum flame-spread and smoke-developed indices of 75 and 450, respectively.

C. Glass-Fiber Board Insulation:

1. Unfaced, Flexible Glass-Fiber Board Insulation: ASTM C 612, Type IA; ASTM C 553, Types I, II, and III; or ASTM C 665, Type I; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; and of the following properties
   a. Nominal density of not less than 1.5 lbs./cu. ft. (24 kg/cu. m) nor more than 1.7 lbs./cu. ft. (26 kg/cu. m), thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
   b. Combustion Characteristics: Passes ASTM E 136.

2. Foil-Faced, Flexible Glass-Fiber Board Insulation: ASTM C 612, Type IA or ASTM C 553, Types I, II, and III; faced on one side with foil-scrim-kraft vapor retarder; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; and of the following properties:
   a. Nominal density of not less than 1.5 lbs./cu. ft. (24 kg/cu. m) nor more than 1.7 lbs./cu. ft. (26 kg/cu. m), thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).

2.2 VAPOR RETARDERS

A. Fire-Retardant, Reinforced-Polyethylene Vapor Retarders: 2 outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either a nonwoven grid of nylon cord or polyester scrim and weighing not less than 22 lbs./1000 sq. ft. (10 kg/100 sq. m), with maximum permeance rating of 0.1317 perm (7.53 ng/Pa x s x sq. m), and flame-spread and smoke-developed indices of not more than 5 and 60, respectively.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.3 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

2.4 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors with Washers: Plate formed from perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square, welded to projecting steel spindle with a diameter of 0.105 inch (2.67 mm) and length capable of holding insulation of thickness indicated securely in position with 1-1/2 inch (38 mm) square or diameter self-locking washers complying with the following:

1. Washers formed from 0.016 inch (0.41 mm) thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than in place.
2. Where anchors are located in walls provide capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap.

B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install insulation to comply with insulation manufacturer's written instructions applicable to products and application indicated. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

B. Protect top surface of underslab insulation from damage during concrete work by applying protection board.

C. Installation of General Building Insulation: Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

1. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant.
2. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
    a. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
3. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
    a. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
    b. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm) support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.
5. For wood-framed construction, install mineral-fiber blankets according to ASTM C 1320 and as follows:
    a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
    b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to produce airtight installation after concealing finish material is in place.

6. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

    a. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions.
    b. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
    c. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
    d. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

7. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.
8. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
9. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

D. Installation of Vapor Retarders: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

1. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (406 mm) o.c.
2. Seal overlapping joints in vapor retarders with adhesives or vapor-retarder tape according to vapor-retarder manufacturer's instructions. Seal butt joints and fastener penetrations with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
3. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor-retarder manufacturer.
4. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
5. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

END OF SECTION 07 21 00
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SECTION 07 42 13 - METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes exposed-fastener, lap-seam metal wall panels.

B. Related Sections:

1. Division 05 Section "Cold-Formed Metal Framing" for support framing, including studs and bracing.
2. Division 07 Section "Modified Bituminous Sheet Air Barriers" for continuous air barrier systems.
3. Division 07 Section "Insulated-Core Metal Wall Panels" for foamed-in-place, insulated metal wall panels.
4. Division 07 Section "Sheet Metal Flashing and Trim" for flashing and other sheet metal work that is not part of metal wall panel assemblies.

1.2 DEFINITION

A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight wall system.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft.

C. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:

a. Uniform pressure of 30 lbf/sq. ft., acting inward or outward.

2. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/180 of the span.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details, including penetrations. Distinguish between factory-, shop- and field-assembled work. Include the following:

1. Flashing and Trim: At a scale of not less than 1-1/2" = 1'-0".
2. Penetrating Items: Indicate location and type of all penetrations (pipes and utilities) and wall-mounted items, including light fixtures, if any. Indicate wall panel layout, including lap points, and lines of attachments/fasteners.

a. Include details, isometrics, and other drawings as required to adequately illustrate how penetrations and wall-mounted items will be integrated, and trimmed, into the wall panels.

C. Samples for Initial Selection: For each type of metal wall panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.
2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Wall Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal wall panel accessories.
2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch- long Samples for each type of accessory.

E. Qualification Data: For Installer.

F. Maintenance Data: For metal wall panels to include in maintenance manuals.

G. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Subcontract the metal panel systems work to a firm which is specialized in the erection of metal panel systems and who has successfully installed work similar in design and extent to that required for the project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 10 years.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Source Limitations: Obtain each type of metal wall panel from single source from single manufacturer.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall panels as shown on Drawings or, if not shown, as directed by Architect; include supports, attachments, and accessories.

    a. Mockup to be full height of parapet wall and at least six panels in length.

2. Conduct water spray test of mockup of metal wall panel assembly, testing for water penetration according to AAMA 501.2.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal wall panel assembly during and after installation.
8. Review wall panel observation and repair procedures after metal wall panel installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal wall panel for period of metal wall panel installation.

E. Protect foam-plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication, and indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of studs and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
2. Surface: Smooth, flat finish.
3. Exposed Coil-Coated Finish:

a. 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

4. Concealed Finish: Finish back side of perforated panels to match exposed face.

B. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.2 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

B. Base or Sill Angles: 0.079-inch nominal thickness.

C. Hat-Shaped, Rigid Furring Channels:

1. Nominal Thickness: 0.040 inch, minimum.
2. Depth: As indicated.

D. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/2 inches, wall attachment flange of 7/8 inch, and depth required to fit insulation thickness indicated.

1. Nominal Thickness: 0.040 inch, minimum.

E. Fasteners for Miscellaneous Metal Framing: Of size, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

1. Material: Type 304 stainless steel.

2.3 MISCELLANEOUS MATERIALS

A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with hex heads matching color of metal wall panels by means of factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.4 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.

B. Asymmetrical-Rib-Profile, Perforated, Concealed-Fastener Metal Wall Panels (MTL-6): Formed with raised, trapezoidal, asymmetrical ribs.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ALPOLIC-TBX; or comparable product by one of the following:

a. Alucobond
b. Alcoa
c. Centria

2. Material: Zinc-coated (galvanized) steel sheet, 0.024-inch nominal thickness.

a. Exterior Finish: 2-coat fluoropolymer.

1) Thickness: Minimum 1.6 mil total dry film thickness (0.8 mil primer and 0.8 mil color topcoat).

b. Color: As selected by Architect from manufacturer's full range.

3. Major-Rib Spacing: As indicated by manufacturer's designation.
4. Panel Coverage: 16 inches.
5. Panel Height: 0.875 inch.
6. Panel Profile: CS-660.
7. Free Area: As selected by Architect from manufacturer's full range of hole sizing and spacing.
8. Locations: Back side of parapet walls and other locations as directed by Architect.

2.5 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, fasciae, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items.

1. Closures: Provide closures at ends of panels, where exposed to view, fabricated of same metal as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
4. Finish exposed trim and accessories to match metal wall panels, unless otherwise indicated.

B. Flashing and Trim: Formed from 0.030-inch minimum thickness, zinc-coated (galvanized) steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance.

1. Finish flashing and trim with same finish system as adjacent metal wall panels.

2.6 FABRICATION

A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal wall panels with joints between panels designed to form weathertight seals.

C. Provide panel profile, including ribs and corrugation, for full length of panel.

D. Fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, and that will minimize noise from movements within panel assembly.

E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

1. Examine wall framing to verify that studs, angles, channels, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
3. Verify that air and water barrier has been installed over sheathing.

B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Framing: Install base angles, sills, furring, and other miscellaneous wall panel support members and anchorages according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

3.3 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to framing unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Commence metal wall panel installation and install minimum of 200 sq. ft. in presence of factory-authorized representative.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. Flash and seal metal wall panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
4. Install screw fasteners in predrilled holes.
5. Locate and space fastenings in uniform vertical and horizontal alignment.
6. Install flashing and trim as metal wall panel work proceeds.
7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
8. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
9. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
10. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners:

1. Steel Wall Panels: Use stainless-steel fasteners.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.

E. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
2. Lap corrugated sheets one full corrugation. Edges of adjacent panels to be uniformly aligned horizontally.
3. Provide washer-backed fasteners bearing on weather side of metal wall panels.
4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
5. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
6. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
7. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps; on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weathertight.
8. At panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

3.4 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal wall panel assembly including trim, corners, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13

SECTION 07 54 23 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered TPO membrane roofing system.
2. Roof insulation.

B. Related Sections:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
3. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
4. Section 221423 "Storm Drainage Piping Specialties" for roof drains.

1.2 DEFINITIONS

A. TPO: Thermoplastic polyolefin.

B. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7 or local Code, whichever is more restrictive.

D. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

E. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

F. Energy Performance: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1 or as required by local Code.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
2. Roof insulation.
3. Metal termination bars.
4. Six insulation fasteners of each type, length, and finish.
5. Six roof cover fasteners of each type, length, and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

D. Field quality-control reports.

E. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Source Limitations: Obtain components including roof insulation fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

D. Exterior Fire-Test Exposure: ASTM E 108, Class C; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

F. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of membrane roofing system.
2. Warranty Period: 15 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible fabric backed TPO sheet.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carlisle SynTec Incorporated.
b. Firestone Building Products Company.
c. GAF Materials Corporation.
d. GenFlex Roofing Systems.
e. Johns Manville.
f. Mule-Hide Products Co., Inc.

2. Thickness: 60 mils (1.5 mm), nominal.
3. Exposed Face Color: White.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard.

D. Slip Sheet: Manufacturer's standard, of thickness required for application.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick (25 mm wide by 1.3 mm thick), prepunched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.3 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class I, Grade 3, felt or glass-fiber mat facer on both major surfaces.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated. Minimum thickness 2 inches and an average R-19 R value for the roof.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.4 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Bead-Applied Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

D. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch (13 mm) thick.

1. Products: Subject to compliance with requirements, provide the following:

a. Georgia-Pacific Corporation; Dens Deck Prime.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

G. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
2. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together.

1. Fasten cover boards according to requirements. Secure to top layer of insulation, setting board in ribbons of bead-applied adhesive, spaced as required to resist loads indicated.

2. Walk boards into place, following adhesive manufacturer’s instructions.

3. Within time frame recommended by adhesive manufacturer, go over insulation boards, both directions, with roller according to adhesive manufacturer's instructions.
4. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.4 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 54 23

SECTION 07 62 00 – SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Manufactured reglets.
2. Formed roof drainage system.
3. Formed low-slope roof flashing and trim.
4. Formed wall flashing and trim.
5. Formed equipment support flashing.
6. Formed overhead-piping safety pans.
7. Accessories necessary for a complete installation.

1.2 ACTION SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Show layouts, profiles, shapes, seams, dimensions, and details for fastening, joining, supporting, and anchoring sheet metal flashing and trim.

C. Samples: For each exposed finish and for joint sealants.

1.3 INFORMATIONAL SUBMITTALS

A. Sealant Compatibility and Adhesion Test Reports: From sealant manufacturer for each combination of joint substrate, primer, backing, and sealant.

1.4 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Sealant Compatibility and Adhesion Testing: Use sealant manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14, finished as follows:

1. High-Performance Organic Finish: Two-coat, thermocured system containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2604.

a. Color: Match Architect's samples.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, No. 2B finish.

C. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality, mill phosphatized for field painting.

D. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
2. Exposed Finishes: Apply the following coil coating:

a. Factory Prime Coating: Factory-applied, baked-on epoxy primer coat.

b. High-Performance Organic Finish: Two-coat thermocured system containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2604, except as modified for below:

1) Humidity and Salt Spray Resistance: 2000 hours.
2) Color: Match Architect's samples.

E. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Felt Underlayment: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

1. Slip Sheet: Rosin-sized paper, minimum 3 lbs./100 sq. ft. (0.16 kg/sq. m).

C. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

E. Elastomeric Sealant: ASTM C 920 and Division 07 Section "Joint Sealants," elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound.

2.4 REGLETS

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions.

1. Manufacturers:

a. Cheney Flashing Company, Inc.
b. Fry Reglet Corporation.
c. Heckmann Building Products Inc.
d. Hickman, W. P. Company.

2. Material: Galvanized steel, 0.0217 inch (0.55 mm) thick.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

D. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with elastomeric sealant concealed within joints.

E. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal, and in thickness not less than that of metal being secured.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Downspouts: Fabricate round downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Manufactured Hanger Style:
2. Fabricate downspouts from the following material:
   a. Prepainted, Metallic-Coated Steel: 0.0217 inch (0.55 mm) thick.

B. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4 inch (100 mm) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.

1. Fabricate parapet scuppers from the following material:
   a. Prepainted, Metallic-Coated Steel: 0.0276 inch (0.7 mm) thick.

C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes, exterior flange trim , and built-in overflows.

1. Fabricate conductor heads from the following material:
   a. Prepainted, Metallic-Coated Steel: 0.0276 inch (0.7 mm) thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing Fascia Caps: Fabricate in minimum 96 inch (2400 mm) long, but not exceeding 10 foot (3 m) long, sections. Furnish with 6 inch (150 mm) wide joint cover plates.

1. Fabricate facia caps from the following material:
   a. Painted Aluminum: 0.050 inch (1.2mm) thick.

B. Copings: Fabricate in minimum 96 inches (2400 mm) long, but not exceeding 10 foot (3 m) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.

1. Fabricate copings from the following material:
   a. Prefinished Aluminum: 0.050 inch (1.2 mm) thick.

C. Base Flashing: Fabricate from the following material:
1. Galvanized Steel: 0.0276 inch (0.7 mm) thick.

D. Counterflashing and Flashing Receivers: Fabricate from the following material:
1. Galvanized Steel: 0.0217 inch (0.55 mm) thick.

E. Roof-Penetration Flashing: Fabricate from the following material:
1. Galvanized Steel: 0.0276 inch (0.7 mm) thick.

F. Roof-Drain Flashing: Fabricate from the following material:

1. Lead: 4.0 lbs./sq. ft. (1.6 mm thick), hard tempered.

2.8 WALL SHEET METAL FABRICATIONS

A. Openings Flashing in Frame Construction: Fabricate through wall head, sill, jamb, spandrel, base course/foundation, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high end dams. Fabricate from the following material:
1. Galvanized Steel: 0.0217 inch (0.55 mm) thick.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following material:
1. Galvanized Steel: 0.0276 inch (0.7 mm) thick.

B. Overhead-Piping Safety Pans: Fabricate from the following material:
1. Galvanized Steel: 0.0396 inch (1.0 mm) thick.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Torch cutting of sheet metal flashing and trim is not permitted.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

D. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

E. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and [**elastomeric**] [**butyl**] sealant.

F. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

G. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with [**elastomeric**] [**butyl**] sealant concealed within joints.

H. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

1. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.
2. Aluminum: Use aluminum or stainless-steel fasteners.

I. Seal joints with elastomeric sealant as required for watertight construction. Comply with recommendations of ASTM C 1193 and Division 07 Section "Joint Sealants."

J. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm) except where pretinned surface would show in finished Work.

1. Do not solder prepainted, metallic-coated steel and aluminum sheet.

3.2 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Downspouts: Join sections with 1-1/2 inch (38 mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.

C. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

D. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch (25 mm) below discharge.

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49.

1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at 16 inch (400 mm) centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49.

1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 16 inch (400 mm) centers.
2. Anchor interior leg of coping with screw fasteners and washers at 18 inch (450 mm) centers.

D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches (100 mm) in direction of water flow.

E. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

F. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Secure in a waterproof manner. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with elastomeric sealant.

G. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.

2. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3.4 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Reglets: Installation of reglets is specified in Division 04 Section "Unit Masonry."

C. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04 Section "Unit Masonry."

D. Openings Flashing in Frame Construction: Install continuous through wall head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

E. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.

F. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

G. Clean exposed metal surfaces for uniform oxidation and weather exposure; neutralize flux materials; clean off excess solder and sealants; and remove strippable films, if any.

END OF SECTION 07 62 00
07620/11-00/ttt

SECTION 07 84 13 – PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:

1. Floors.
2. Roofs.
3. Walls and partitions.

B. Related Sections:
1. Division 22 Sections specifying piping penetrations.
2. Division 23 Sections specifying duct penetrations.
3. Division 26 Sections specifying cable and conduit penetrations.

1.2 ACTION SUBMITTALS

A. Through-Penetration Firestopping Schedule: Submit, for information only, a Through-Penetration Firestopping Schedule indicating the type of through-penetration firestop system to be installed for each penetration. Indicate each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of Underwriters Laboratories that evidences compliance with requirements for each condition indicated, and listed in the "Through Penetration Firestopping Schedule" at the end of Part 3 of this Section.

1. Submit documentation, including illustrations, from Underwriters Laboratories applicable to each through-penetration firestop.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.

1.4 CLOSEOUT SUBMITTALS

A. At Project Closeout, submit a list of systems installed, the UL design designations, and the location of each system. The submittal must have the Installer's signature.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified or licensed, by firestop system manufacturer as experienced and with sufficient trained staff to install manufacturer's products

according to specified requirements. A manufacturer's willingness to sell its firestop system materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:

1. Firestop tests performed by Underwriters Laboratories.
2. Through-penetration firestop systems identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements.

    a. Through-penetration firestop system products bearing classification marking of Underwriters Laboratories.
    b. Through-penetration firestop systems corresponding to those indicated by reference to through-penetration firestop system designations listed in the UL "Fire Resistance Directory."

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Provide through-penetration firestop systems to accommodate sizes of sleeves, openings, core-drilled holes, or cut openings.

C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Architect, Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide through-penetration firestop systems that are produced by manufacturers listed in UL-Classified Through Penetration Fire Stopping Assemblies in the Schedule at the end of Part 3 of this Section.

2.2 PERFORMANCE REQUIREMENTS

A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.

1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
3. Fire-resistance-rated floor assemblies.
4. Fire-resistance-rated roof assemblies.

B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined by tests conducted according to UBC Standard 7-5, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated. F-rating shall be not less than the required rating of the element penetrated, but not less than 1 hour, minimum

C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per UBC Standard 7-5, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

1. Penetrations located outside wall cavities.
2. Penetrations located outside fire-resistive shaft enclosures.
3. Penetrations located in construction containing fire-protection-rated openings.
4. Penetrating items larger than 4 inch (100 mm) diameter nominal pipe or 16 sq. in. (10 sq. mm) in overall cross-sectional area.
5. Provide T-rating not less than the required rating of the element penetrated, but not less than 1 hour, minimum.

D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

E. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

2.3 FIRESTOPPING, GENERAL

A. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

B. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

D. Accessories: Provide components for each through-penetration firestop system needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by Underwriters Laboratories for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:

a. Slag-/rock-wool-fiber insulation.
b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
c. Fire-rated form board.

2. Substrate primers.

3. Collars.

E. Gypsum Products: The use of gypsum products for through-penetration firestopping is strictly prohibited.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with UL firestopping design requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Protection: Prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove smears as soon as possible without damaging substrate or disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

3.6 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

A. Select UL-classified systems from the attached schedule and submit "Through-Penetration Firestopping Schedule" as specified in Article 1.4, Submittals.

THROUGH PENETRATION FIRE STOPPING SCHEDULE

THIS SCHEDULE INDICATES WHICH SERIES OF UL CLASSIFIED THROUGH PENETRATION FIRE STOPPING (TPFS) ASSEMBLIES ARE ACCEPTABLE FOR THIS PROJECT BASED ON BARRIER TYPE, BARRIER CONSTRUCTION AND PENETRANT TYPE.
EACH SYSTEM WITHIN A GIVEN SERIES IS CLASSIFIED FOR SPECIFIC PENETRATION CONDITIONS. CONTRACTOR SHALL SELECT TPFS ASSEMBLIES THAT ARE CLASSIFIED FOR USE WITH EACH PENETRATION'S CONDITION BASED ON CRITERIA SUCH AS THE FOLLOWING: PENETRATION SIZE, PENETRATION SHAPE, PENETRANT SIZE(S), PENETRANT MATERIAL(S), PENETRANT QUANTITY, LOCATIONS(S) OF PENETRANT(S) WITHIN PENETRATION.

BARRIER			PENETRANT TYPE										
TYPE	BASIS OF CONSTRUCTION	FIRE STOPPING REQUIREMENTS	NO PENETRANTS	METALLIC, UNINSULATED PIPE, CONDUIT, OR TUBING (EXAMPLES: COPPER, IRON, STEEL)	NONMETALLIC, UNINSULATED PIPE, CONDUIT, OR TUBING (EXAMPLES: PVC, CPVC, GLASS)	ELECTRICAL CABLES	CABLE TRAYS W/ELECTRICAL CABLES (NOTE 9)	INSULATED PIPES (EXAMPLES: COPPER, GLASS, IRON, PLASTIC, STEEL) IN SYSTEMS OPERATING BETWEEN 32 DEGF (0 DEGC) AND 122 DEGF (50 DEGC) (NOTE 1)	INSULATED PIPES (EXAMPLES: COPPER, GLASS, IRON, PLASTIC, STEEL) IN SYSTEMS OPERATING BETWEEN 32 DEGF (0 DEGC) OR ABOVE 122 DEGF (50 DEGC) (NOTE 2)	MISC ELECTRICAL PENETRATIONS (EXAMPLES: BUS DUCTS)	METAL DUCT	UL LISTED ELECTRICAL BOXES	OTHER RECESSED DEVICES (NOTE 3)
WALL	WOOD STUDS & GYPSUM WALLBRD	UL CLASSIFIED SYSTEM — SINGLE PENETRANT	W-L-0000 SERIES OR NOTE 4	W-L-1000 SERIES	W-L-2000 SERIES	W-L-3000 SERIES	W-L-4000 SERIES	W-L-5000 SERIES	W-L-5000 SERIES	W-L-6000 SERIES	W-L-7000 SERIES	CLIV OR NOTE 8	NOTE 8
UL DESIGN NO. - U300 SERIES		UL CLASSIFIED SYSTEM — MULTIPLE PENETRANTS	W-L-0000 SERIES OR NOTE 4	W-L-8000 SERIES NOTE 5		W-L-3000 SERIES	W-L-4000 SERIES	W-L-8000 SERIES NOTE 5	W-L-8000 SERIES NOTE 5	N/A	N/A	N/A	
		F RATING	EQUAL TO BARRIER RATING										
		T RATING	EQUAL TO F RATING (NOTE 9)										
		ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE
WALL	METAL STUDS & GYPSUM WALLBRD	UL CLASSIFIED SYSTEM — SINGLE PENETRANT	W-L-0000 SERIES OR NOTE 4	W-L-1000 SERIES	W-L-2000 SERIES	W-L-3000 SERIES	W-L-4000 SERIES	W-L-5000 SERIES	W-L-5000 SERIES	W-L-6000 SERIES	W-L-7000 SERIES	CLIV OR NOTE 8	NOTE 8
UL DESIGN NO. - U400 SERIES		UL CLASSIFIED SYSTEM — MULTIPLE PENETRANTS	W-L-0000 SERIES OR NOTE 4	W-L-8000 SERIES NOTE 5		W-L-3000 SERIES	W-L-4000 SERIES	W-L-8000 SERIES NOTE 5	W-L-8000 SERIES NOTE 5	N/A	N/A	N/A	
		F RATING	EQUAL TO BARRIER RATING										
		T RATING	EQUAL TO F RATING (NOTE 9)										
		ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE
WALL	POURED CONC., CONC. BLOCK OR MASONRY	UL CLASSIFIED SYSTEM — SINGLE PENETRANT	W-J-0000 SERIES OR NOTE 4	C-AJ-1000 OR W-J-1000 SERIES	C-AJ-2000 OR W-J-2000 SERIES	C-AJ-3000 OR W-J-3000 SERIES	C-AJ-4000 OR W-J-4000 SERIES	C-AJ-5000 OR W-J-5000 SERIES	C-AJ-5000 OR W-J-5000 SERIES	C-AJ-6000 SERIES	C-AJ-7000 OR W-J-7000 SERIES	??	NOTE 8
UL DESIGN NO. FOR CONCRETE BLOCK WALL - U900 SERIES (ANY THICKNESS)		UL CLASSIFIED SYSTEM — MULTIPLE PENETRANTS	W-J-0000 SERIES OR NOTE 4	C-AJ-8000 OR W-J-8000 SERIES -- NOTE 5		C-AJ-3000 OR W-J-3000 SERIES	C-AJ-4000 OR W-J-4000 SERIES	C-AJ-8000 OR W-J-8000 SERIES - NOTE 5	C-AJ-8000 OR W-J-8000 SERIES - NOTE 5		N/A	N/A	
		F RATING	EQUAL TO BARRIER RATING										
		T RATING	EQUAL TO F RATING (NOTE 9)										

	ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE
WALL POURED CONC. BLOCK OR MASONRY UL DESIGN NO. FOR CONCRETE BLOCK WALL - U900 SERIES MINIMUM THICKNESS GREATER THAN EIGHT inchES	UL CLASSIFIED SYSTEM SINGLE PENETRANT	NOTE 4	C-BK-1000 OR W-K-1000 SERIES	N/A	N/A	W-K-4000 SERIES	N/A	N/A		N/A		N/A	NOTE 8
	UL CLASSIFIED SYSTEM MULTIPLE PENETRANTS		N/A										
	F RATING		EQUAL TO BARRIER RATING										
	T RATING		EQUAL TO F RATING (NOTE 9)										
	ADDITIONAL REQUIREMENTS	NONE											
FLOOR FRAMED	UL CLASSIFIED SYSTEM SINGLE PENETRANT	NOTE 4	F-C-1000 SERIES	F-C-2000 SERIES	F-C-3000 SERIES	N/A	F-C-5000 SERIES	F-C-5000 SERIES	N/A	F-C-7000 SERIES	??	NOTE 8	
	UL CLASSIFIED SYSTEM MULTIPLE PENETRANTS		F-C-8000 SERIES NOTE 5				F-C-8000 SERIES NOTE 5	F-C-8000 SERIES NOTE 5		N/A	N/A		
	F RATING		EQUAL TO BARRIER RATING										
	T RATING		EQUAL TO F RATING (NOTE 9)										
	ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE	
FLOOR POURED CONC. ANY THICKNESS	UL CLASSIFIED SYSTEM SINGLE PENETRANT	C-AJ-0000 SERIES, F-A-0000 SERIES OR NOTE 4	C-AJ-1000 OR F-A-1000 SERIES	C-AJ-2000 OR F-A-2000 SERIES	C-AJ-3000 OR F-A-3000 SERIES	C-AJ-4000 OR F-A-4000 SERIES	C-AJ-5000 OR F-A-5000 SERIES	C-AJ-5000 OR F-A-5000 SERIES	C-AJ-6000 SERIES	C-AJ-7000 OR F-A-7000 SERIES	??	NOTE 8	
	UL CLASSIFIED SYSTEM MULTIPLE PENETRANTS		C-AJ-8000 OR F-A-8000 SERIES -- NOTE 5				C-AJ-8000 OR F-A-8000 SERIES - NOTE 5	C-AJ-8000 OR F-A-8000 SERIES - NOTE 5		N/A	N/A		
	F RATING		EQUAL TO BARRIER RATING										
	T RATING		EQUAL TO F RATING (NOTE 9)										
	ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE	
FLOOR POURED CONC. MINIMUM THICKNESS GREATER THAN FIVE inchES	UL CLASSIFIED SYSTEM SINGLE PENETRANT	C-BJ-0000 SERIES OR NOTE 4	C-BJ-1000 OR F-B-1000 SERIES	C-BJ-2000 OR F-B-2000 SERIES	C-BJ-3000 OR F-B-3000 SERIES	C-BJ-4000 OR F-B-4000 SERIES	C-BJ-5000 OR F-B-5000 SERIES	C-AJ-5000 OR F-A-5000 SERIES	C-AJ-6000 SERIES	C-BJ-7000 OR F-B-7000 SERIES	??	NOTE 8	
	UL CLASSIFIED SYSTEM MULTIPLE PENETRANTS		C-BJ-8000 OR F-B-8000 SERIES -- NOTE 5				C-AJ-8000 OR F-A-8000 SERIES - NOTE 5	C-BJ-8000 OR F-B-8000 SERIES - NOTE 5		N/A	N/A		
	F RATING		EQUAL TO BARRIER RATING										
	T RATING		EQUAL TO F RATING (NOTE 9)										
	ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE	

THIS SCHEDULE USES THE IDENTIFICATION SYSTEMS OF UNDERWRITERS LABORATORIES, INC. AS DEFINED IN THEIR "FIRE RESISTANCE DIRECTORY" AND AS USED BY MANUFACTURERS ON THEIR UL CLASSIFIED SYSTEM.

INDICATED RATINGS MAY BE EXCEEDED. "N/A" = NOT APPLICABLE

NOTES

1. EXAMPLES OF SYSTEMS THAT OPERATE BETWEEN 32 DEGF (0DEGC) AND 122 DEGF (50 DEGC):

	DOMESTIC HOT WATER
CHILLED WATER	LESS THAN 122 DEGF (50
SUPPLY & RETURN	DEGC)
	DOMESTIC HOT WATER
HEAT PUMP WATER	RECIRCULATION LESS
SUPPLY & RETURN	THAN 122 DEGF (50 DEGC)

DOMESTIC COLD WATER

2. EXAMPLES OF SYSTEMS OPERATING BELOW 32 DEGF (0DEGC) OR ABOVE 122 DEGF (50 DEGC):

STEAM SUPPLY &	HEATING HOT WATER
RETURN	SUPPLY & RETURN
	HOT-CHILLDED WATER
STEAM VENT	SUPPLY & RETURN
CONDENSATE PUMP	GLYCOL HEATING HOT
DISCHARGE	WATER SUPPLY & RETURN
	DOMESTIC HOT WATER
BOILER BLOW DOWN	SUPPLY 140 DEGF (60 DEGC)
	DOMESTIC HOT WATER
	RECIRCULATION 140 DEGF
CRYOGENIC VENT	(60 DEGC)

3. EXAMPLES OF OTHER RECESSED DEVICES:

MEDICAL GAS ZONE	
VALVES	UNIT HEATERS
MEDICAL GAS OUTLETS	FIRE FIGHTERS' PHONE
	FIRE EXTINGUISHER
FIRE VALVE CABINETS	CABINET

FIRE HOSE CABINETS

4. SEAL OPENING USING BARRIER'S ORIGINAL CONSTRUCTION.
5. WHERE A SERIES 8000 CLASSIFIED SYSTEM IS NOT AVAILABLE, INSTALL PENETRANTS SINGLY, AND PROVIDE SINGLE-PENETRANT SYSTEMS.
6. FOR SYSTEMS THAT OPERATE BELOW 32 DEGF (0DEGC) OR ABOVE 122 DEGF (50 DEGC), COMPLY WITH THE FOLLOWING ADDITIONAL REQUIREMENTS:
   A. PROVIDE TPFS SYSTEM USING INTUMESCENT ELASTOMERIC WRAP STRIP AS ITS FILL, VOID, OR CAVITY MATERIAL.
   B. DO NOT USE SERIES 8000 PENETRATIONS. PROVIDE ONLY SINGLE PENETRATIONS.
7. FOR PENETRATIONS PROTECTED WITH DAMPERS, PROVIDE TPFS SYSTEM APPROVED BY DAMPER MANUFACTURER.
8. WHERE UL CLASSIFIED SYSTEMS ARE NOT AVAILABLE FOR OTHER RECESSED DEVICES, MAINTAIN CONTINUITY OF RATED BARRIER CONSTRUCTION AROUND RECESS.
9. PROVIDE PILLOW TYPE FIRESTOP SYSTEM TO FILL VOIDS IN CABLE TRAYS AT COMPUTER SERVER ROOMS, AND WHERE INDICATED AS "FREQUENTLY MODIFIED" LOCATIONS.
10. THE USE OF GYPSUM PRODUCTS IS STRICTLY PROHIBITED.

NOTE:
For Project Closeout, submit a list of systems installed, the UL numbers, and the location of each system. The submittal must have the installer's signature.

END OF SECTION 07 84 13
07841/11-99/bac

SECTION 07 92 00 – JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes sealants for the following applications:

1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:

    a. Control and expansion joints in unit masonry.
    b. Joints in acrylic plaster (stucco) systems.
    c. Joints between metal panels in curtain wall system.
    d. Joints between glass for structural glazing.
    e. Joints between different materials listed above.
    f. Perimeter joints between materials listed above and frames of doors and windows and louvers.
    g. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:

    a. Joints between concrete and steel column.
    b. Control, expansion, and isolation joints in cast-in-place concrete slabs.
    c. Joints between different materials listed above.
    d. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings where indicated.
    c. Tile control and expansion joints.
    d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
    e. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    f. Other joints as indicated.

4. Interior joints in the following horizontal traffic surfaces:

    a. Control and expansion joints in cast-in-place concrete slabs.
    b. Control and expansion joints in tile flooring.
    c. Other joints as indicated.

B. Single Subcontract Responsibilities: Refer to Division 08 Section[**s**] "Glazed Aluminum Curtain Walls," "Aluminum-Framed Entrances and Storefronts," and "Aluminum Windows" for requirements applicable to single subcontract responsibility.

1.2 ACTION SUBMITTALS

A. Product Data: Submit product data for each joint-sealant product indicated and the following:

1. Written certification from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use(s) indicated as verified through manufacturer's in-house testing laboratory.

a. Test results for all job specific concealed and exposed sealants confirming compatibility and adhesion are mandatory for all materials in contact with exterior glazing, curtain wall components, metal panels, masonry units, and exterior cladding, prior to erection of sample installations.
b. Complete instructions for handling, storage, mixing, priming, installation, curing and protection of each type of sealant.

2. Laboratory and field test results confirming joint preparation (cleaning/priming), chemical compatibility, and proper adhesion for specified joint sealant for each of the joint profiles and substrate materials included in the design of this project.

B. Samples: Submit samples of each type and color of exposed joint sealant required. Provide fully cured joint sealant samples in 3/4 inch (19 mm) wide joints 12 inches (300 mm) long formed between two strips of material to be sealed as they will appear on the Project.

1.3 INFORMATIONAL SUBMITTALS

A. Warranties: Submit specified warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Exposed sealant work including, but not limited to, sealants used for air and weatherseals which are external to curtain wall systems at their perimeter, shall be performed by one firm specializing in the installation of sealants who has successfully produced work comparable to this project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 10 years. Concealed sealant work (sealants which are internal to curtain wall systems,necessary for air and moisture penetration resistance under applied loads) shall be the responsibility of the subcontractor responsible for the final design, installation, and performance of the respective system.

B. Source Limitations: Obtain each type of joint sealant, and each type of structural silicone adhesive, from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing (All Exterior Wall Sealants Only): Submit to joint sealant manufacturers, prior to full size building mockup(s) sample installation(s), samples of materials that will contact or affect, by direct or indirect chemical or mechanical means, exterior wall joint sealants for compatibility and adhesion testing below.

1. General: Test results confirming compatibility and adhesion are mandatory for all concealed and exposed sealant materials in contact with exterior glazing, other exterior

materials, other sealants, flashings, metal framing, and shims, prior to the construction of full sized mockup and testing.

a. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the work.

1) It is anticipated that a minimum of 3 months will be required to complete preconstruction sealant compatibility and adhesion testing.

b. Investigate materials that fail compatibility and adhesion testing and obtain sealant manufacturer's written recommendations for corrective measures, which may include the use of primers, cleaners, cleaning measures, curing time, temperature limitations (surface and air), humidity conditions, moisture content of substrate, etc.

c. Definitions:

1) Compatibility: The capability of the sealant materials and substrates to be placed in direct contact with each other and maintain their required physical, chemical and visual qualities with the absence of softening, staining, oil exudation, discoloration or other detrimental, deleterious or degradative effects caused by chemical interactions.
2) Adhesion: The mechanical or chemical ability of the sealant materials and substrates to adhere or bond together at their interface.

d. Specimen Sizes and Shapes: As required by the manufacturer's testing laboratory for the tests listed, unless otherwise specified.

2. Tests Required:

a. Adhesion in Peel Testing:

1) Test Methods:

a) Comply with ASTM C794 'Adhesion and Peel of Elastomeric Joint Sealants,' modified to include project specific substrates and to report cohesive or adhesive failure mode. Samples of each exterior material, other sealants, flashings, metal framing in contact with the concealed and exposed sealant materials are required to be tested.
b) Comply with ASTM C1135 'Determining Tensile Adhesion Properties of Structural Sealants,' modified to include project specific substrates and the following. Sealant manufacturer’s modified interpretations of ASTM C1135 will not be permitted. Samples of each exterior structural glazing and metal framing in contact with the structural sealant materials are required to be tested. In addition to the testing being performed under the standard environmental conditioning required of ASTM C1135; the Contractor shall prepare, and test, additional specimens for each project specific environmental condition under which the sealant will be applied and cured.

2) All specimens shall be tested for primed and unprimed performance.

3) Report:

a) Date(s) of testing.
b) Project identification.
c) Test method (as identified herein).
d) Specimen substrate(s) tested.
e) Sealant(s) tested.
f) Substrate preparation (cleaning materials, methods and primers used).
g) Test results for each specimen tested (type of failure - adhesive or cohesive - force measured at failure in pounds per lineal inch).
h) Recommendations. Where testing shows equal or better performance without a primer, a primer will not be required.
i) Additional remarks, if any (i.e., color change of substrate or sealant, voids in the body of the sealant when examined in cross section, blistering, bubbling, sealant softening, or evidence of improperly mixed or cured sealant).

b. Compatibility Testing: This test method describes an accelerated laboratory procedure to determine if the proposed sealant materials and substrates are compatible.

1) Test Methods:

a) Comply with ASTM C1248 'Staining of Porous Substances by Joint Sealants,' modified to include project specific substrates. Samples of each exterior material, and other sealants, in contact with the concealed and exposed sealant materials are required to be tested.
b) Comply with ASTM C1087 'Determining Compatibility of Liquid Applied Sealants with Accessories Used in Structural Glazing Systems,' modified to include project specific substrates. Sealant manufacturer’s modified interpretations of ASTM C1087 will not be permitted. Samples of each exterior dry glazing gasket (if any), spacers, shims and setting blocks proposed for use in contact with the structural sealant materials are required to be tested.

2) All specimens for ASTM C1248 testing shall be tested for primed and unprimed performance.
3) Report:

a) Date(s) of testing.
b) Project identification.
c) Test method (as identified herein).
d) Substrate preparation (cleaning materials, methods and primers used).
e) Name of sealant, type of sealant, rated movement capability and identifying batch number.
f) Substrates used.
g) Testing Equipment: Manufacturer of apparatus, type of lamps.
h) Statement describing curing conditions if other than at standard conditions.
i) Description of, and reasons for, any variations from the test procedure.

j) Description of test effects observed, such as change in finished surface appearance, discoloration into the substrate, adhesion failure, or other characteristics; average measurement of stain width and depth.
k) Recommendations. Where testing shows equal or better performance without a primer, a primer will not be required.
l) Additional remarks, if any. (i.e., color change of substrate or sealant, voids in the body of the sealant when examined in cross section, blistering, bubbling, sealant softening, or evidence of improperly mixed or cured sealant).

c. Preconstruction Field-Adhesion Testing: Before installing exposed exterior elastomeric sealants, field test their adhesion to joint substrates as follows:

1) Locate test joints where indicated or, if not indicated, as directed by Architect.
2) Conduct field tests for each type of exposed exterior elastomeric sealant and joint substrate indicated.
3) The Architect and manufacturer's technical representative, shall be present when joints are tested.
4) Test Method: Test exterior elastomeric joint sealants by hand-pull method described below:

a) Install joint sealants in 60 inch (1500 mm) long joints using same materials and methods for joint preparation and joint-sealant installation in accordance with manufacturer's final laboratory testing recommendations. Allow sealants to cure.
b) Make knife cuts from one side of joint to the other, followed by two cuts approximately 3 inch (75 mm) long at sides of joint and meeting cross cut at one end. Place a mark 1 inch (25 mm) from cross-cut end of 3 inch (75 mm) piece.
c) Use fingers to grasp 3 inch (75 mm) piece of sealant between cross-cut end and 1 inch (25 mm) mark; pull firmly down at a 90-degree angle to the joint and hold sealant in this position for ten seconds; following the ten second time duration pull sealant at a 180 degree angle parallel to the joint and hold the sealant in this position for ten seconds. Pull sealant away from joint to the distance recommended by sealant manufacturer for testing adhesion.
d) Repair joint as recommended by the sealant manufacturer.

5) Sealants evidencing adhesive failure with one or both substrates during testing, and/or a level of elongation prior to failure that is not in compliance with the performance characteristics specified herein or otherwise published by the sealant manufacturer will be subject to rejection by the Architect. Discontinue use of joint sealants, cleaning agents, primers, and application methods associated with failures documented during testing and immediately notify manufacturer and Architect for further review.

3. Report: Provide written summary of each compatibility and adhesion test.

D. Mockups and Sample Installations: Provide mockups and sample installations of sealants at locations indicated or required by the Architect. Mockups and sample installations shall represent the primary types of materials, substrate surfaces, joint size, exposure, and other conditions to be encountered in the work. Preparation, priming, application, and curing, shall comply with manufacturer's recommendations and actual proposed methods. Schedule the applications, with allowance for sufficient curing time, so that samples may be examined and necessary adjustments made at least 1 week prior to date scheduled for commencing installation of the work.

1. The mockups and sample installations shall be visually examined for staining, dirt pickup, shrinkage, color, general workmanship and appearance. Cut and pull the sealant from each sample joint to examine for internal bubbles or voids, adhesion, and general compatibility with substrate.

2. Mockups and sample installations are required in conjunction with the following:

   a. Division 03 Section "Cast-In-Place Architectural Concrete."
   b. Division 08 Section "Aluminum-Framed Entrances and Storefront."
   c. Division 08 Section "Aluminum Windows."
   d. Division 08 Section "Glazed Aluminum Curtain Walls."
   e. Division 09 Section “Acrylic Plaster"

E. Preinstallation Conference: As soon as possible after award of exterior joint sealant work, but no later than 2 weeks before the installation of the joint sealants, meet with Installer, Owner, Architect, installers of the substrate construction, and other work adjoining joint sealants and representatives of any other entities directly concerned with joint sealant performance. Conduct conference at Project site to comply with the following:

1. Review foreseeable methods and procedures related to sealing substrates, including but not limited to, the following:

   a. Discuss substrates to be sealed, discuss as fabricated and installed condition of substrate, sealant application, flashing details, and other preparatory work.
   b. Review joint sealant requirements: drawings, specifications, and other contract documents.
   c. Review required submittals, both complete and incomplete.
   d. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.
   e. Review changes arising from the pre-construction mockup and performance testing program, if any.

2. Record discussion and furnish copy of recorded discussions to each attendee.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F (4.4 deg C).

2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealant work which has failed to provide a weathertight system within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.

B. Special Manufacturer's Warranties: Written warranties (weatherseal and stain resistance), signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that fail to provide airtight and watertight joints, or fail in adhesion, cohesion, abrasion-resistance, stain-resistance, weather resistance, or general durability or appear to deteriorate in any other manner not clearly specified in the manufacturer's data as an inherent quality of the material within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as stated by sealant manufacturer's published data, and as substantiated by the manufacturer for each application through testing.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: Not more than 250 g/L.
2. Sealant Primers for Nonporous Substrates: Not more than 250 g/L.
3. Sealant Primers for Porous Substrates: Not more than 775 g/L.

C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Colors: For fully concealed joints, provide manufacturer's standard color of sealant which has the best overall performance characteristics for the application shown. For exposed joints provide color selected by Architect from manufacturers' full range of colors.

E. Manufacturer's Representative: Do not use elastomeric sealant produced by a manufacturer who will not agree to send a qualified technical representative to the project site when requested, for the purpose of rendering advice concerning the proper installation of manufacturer's materials.

2.2 ELASTOMERIC JOINT SEALANTS

A. Silicone Sealants for Vertical Applications (Non-Sag):

1. Typical Interior Glass Wall Butt Joints: Comply with ASTM C1184 and ASTM C920, Type S, Grade NS, Class 50; use NT, G, and A, black color unless otherwise indicated.

   a. Products and Manufacturers: One of the following:

      1) 795; Dow Corning.
      2) Spectrem 2; Tremco, an RPM Co.
      3) Silpruf SCS 2000; GE Advanced Materials – Silicone.

2. Typical Exterior Wall Joints:

   a. Properties:

      1) Standards: Comply with ASTM C920, Type M or S, Grade NS, Class 25 or 50; use NT, M, A and O.
      2) Performance: Non-stain, non-bleed, non-streaking to sealed and adjacent substrates. The minimum peel adhesion value after 7 day immersion shall not be less than 13 pli (2.27 kN/m) when tested in strict accordance with ASTM C794 Adhesion in Peel.
      3) Cure System and Oil Content: Neutral-cure, low or medium modulus system specifically manufactured with controlled oil content to eliminate oil migration into sealed substrates and residue rundown over and onto adjacent substrates.

   b. Products and Manufacturers: One of the following:

      1) 756 SMS; Dow Corning.

2) Spectrem 3 or Spectrem 4-TS (Use Spectrem 1 for metal to metal joints); Tremco, an RPM Co.
3) Silpruf NB SCS 9000 (use Silpruf SCS 2000 for metal to metal joints); GE Advanced Materials – Silicones.

3. Structural Glazing at Exterior Curtain Walls:

a. Structural and Weatherseal Beads for Unitized Four Side Shop Glazed Structural Silicone Curtain Wall Systems (Two-Part Silicone Sealants):

1) Properties:

a) Standards: Comply with ASTM C 1184 and ASTM C 920, Type M, Grade NS, Class 12.5 or 25; use NT, G, and A.
b) Performance: The minimum tensile adhesion strength shall be 120 psi with the sealant design tensile and shear stress calculated at 20 psi resulting in a minimum 6 to 1 safety factor. Provide laboratory testing and calculations indicating product working stress and safety factors, in addition provide insulating glass manufacturer's written concurrence, based on testing to actual job production run samples of glass and framing materials, the product is proper for the uses shown and specified.
c) Cure System: Shelf storage stable, neutral-cure, high modulus, system which is compatible and adherent to the two part insulating glass edge seals, glazing accessories and metal window frame materials being provided for the project.
d) Color: Black.

2) Products and Manufacturers: One of the following:

a) 983 Structural Glazing and Curtainwall Adhesive/Sealant base x curing agent; Dow Corning Corporation.
b) Proglaze II; Tremco, an RPM Co.
c) UltraGlaze SSG 4400; GE Advanced Materials – Silicones.

b. Structural and Weatherseal Beads for 2-side Field Glazed Structural Curtainwall Joints:

1) Properties:

a) Standards: Comply with ASTM C 1184 and ASTM C 920, Type S, Grade NS, Class 25 or 50; use NT, G, and A.
b) Performance: The minimum tensile adhesion strength shall be 120 psi with the sealant design tensile and shear stress calculated at 20 psi resulting in a minimum 6 to 1 safety factor. Provide laboratory testing and calculations indicating product working stress and safety factors, in addition provide insulating glass manufacturer's written concurrence, based on testing to actual job production run samples of glass and framing materials, the product is proper for the uses shown and specified.

c) Cure System: Shelf storage stable, neutral-cure, high modulus, system which is compatible and adherent to the two part insulating glass edge seals, glazing accessories and metal window frame materials being provided for the project.
d) Color: Black.

2) Products and Manufacturers:

a) 995 Silicone Structural Adhesive; Dow Corning Corporation.
b) Proglaze SSG; Tremco, and RPM Co.
c) UltraGlaze SSG 4000; GE Advanced Materials – Silicones.

B. Two Part Polyurethane Sealants for Vertical Applications (Non-Sag):

1. Typical Exterior Wall Joints (Two-part Polyurethane Sealants):

a. Properties:

1) Standards: Comply with ASTM C920, Type M, Grade NS, Class 25 or Class 50; use NT, M, A and O.
2) Performance: Non-stain, non-bleed, non-streaking to sealed and adjacent substrates. The minimum peel adhesion value after 7 day immersion shall not be less than 13 pli (2.27 kN/m) when tested in strict accordance with ASTM C794 Adhesion in Peel.

b. Products and Manufacturers: One of the following:

1) Pecora Corporation; Dynatrol II.
2) BASF; Sonneborn Systems, Sonolastic NP-2™.
3) Tremco, an RPM Co.; Dymeric 240.

C. Two-Part Polyurethane Sealant for Paving Applications:

1. For Paving Applications with Slopes not Exceeding 5% (Self Leveling): ASTM C 920, Type M, Grade P, Class 25; use T and I; with high durometer hardness and abrasion resistance, and rated for water immersion; one of the following:

a. Pecora Corporation; Urexpan NR-200.
b. BASF; Sonneborn Systems, Sonolastic SL 2™.
c. Tremco, an RPM Co.; THC 900.

D. Sealants for Contact with Food: Comply with 21 CFR 177.2600, NSF Standard 51, and ASTM C 920 for Type S, Grade NS, Class 25, Use NT.

1. Dow Corning; 786 Mildew Resistant Silicone Sealant.

E. Mildew-Resistant Silicone Sealant (use for joints at toilet fixtures, toilet room countertops and vanities, and at janitor closet mop receptor to wall transition): Complying with ASTM C 920, Type S (single component), Grade NS (non-sag), class 25, Use NT (non-traffic), Substrate uses G, A, and O; and containing a fungicide for mildew resistance; white color.

1. Products: Provide one of the following:

    a. Dow Corning; 786 Mildew Resistant Silicone Sealant.
    b. GE Advanced Materials - Silicones; Sanitary SCS 1700.
    c. Pecora Corporation; 898 Silicone Sanitary Sealant.
    d. Tremco, an RPM Co.; Tremsil 200 Sanitary.

2.3 LATEX JOINT SEALANTS

A. Latex Sealant: Non-elastomeric, one part, non-sag, paintable latex sealant that is recommended for exposed applications on the interior. Complying with ASTM C 834, Type OP (opaque sealants):

1. Products: Provide one of the following:

    a. Pecora Corporation; AC-20 + Silicone.
    b. BASF; Sonneborn Systems, Sonolastic Sonolac.
    c. Tremco, an RPM Co.; Tremflex 834.

2.4 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: One of the following preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding backings of flexible plastic foam complying with ASTM C 1330, and of type indicated below. Select shape and density of cylindrical sealant backings in consultation with the manufacturer for proper performance in specific condition of use in each case.

1. Type C: Closed-cell polyethylene foam material with a surface skin, which is nonabsorbent to liquid water and gas, non-outgassing in unruptured state; one of the following:

    a. HBR Closed Cell Backer Rod; Nomaco, Inc.
    b. Sonneborn Closed-Cell Backer-Rod; BASF.

2. Type B: Bi-cellular reticulated, polymeric foam material with a surface skin, nonoutgassing, with a density of between 1.5-3.0 pcf (24-48 kg/cubic meter) per ASTM D 1622 and minimum tensile strength of greater than 29-38 psi (200-267 kPa) per ASTM D 1623, and with water absorption less than 0.058 oz./cubic inch (0.10 gm/cc) per ASTM C 1016; one of the following:

    a. SOFROD; Nomaco, Inc.
    b. Sonneborn Sonolastic Soft Backer-Rod; BASF.

C. Bond-Breaker Tape: Polyethylene, TFE fluorocarbon, or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler

materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended, as verified through compatibility and adhesion testing, by joint sealant manufacturer for the substrates indicated to be sealed.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and which will not stain nor mar the finish of surfaces adjacent to joints to which it is applied.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Silicone Glazing Sealants: Refer to Division 08 Section "Glazing."

B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

1. Remove foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), existing joint sealants, existing backer rods, existing waterproofing materials, existing water repellent treatments, oil, grease, water, surface dirt, and frost.
2. Clean concrete, masonry, unglazed surfaces of tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form-release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

C. Joint Priming (Elastomeric Sealants Only): Prime joint substrates where recommended in writing by joint sealant manufacturer, based on prior testing and experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration beyond bond areas or onto adjoining surfaces.

D. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant and primer smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

1. Silicone Glazing Sealants: Refer to Division 08 Section "Glazing" for installation.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    a. Do not leave gaps between ends of sealant backings. Trim for tight fit around obstructions or elements penetrating the joint.
    b. Do not stretch, twist, puncture, or tear sealant backings.
    c. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry sealant backings.

2. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.
3. Install weeps and vents into joints at the same time sealants are being installed. Unless otherwise shown on the drawings, or directed by the Architect, locate weeps and vents spaced as recommended by the sealant manufacturer and the window and curtain wall fabricator and erector. Do not install weeps and vents at outside building corners. Do not install vents at horizontal joints immediately below shelf angles, sills, and through wall flashings.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

1. Apply sealants in the depth shown or, if none is shown, apply in accordance with the manufacturer's recommendations and the following general proportions and limitations:

a. Apply elastomeric sealants in sidewalk, pavement and similar horizontal joints to a depth equal to 75% of the joint width, but not less than 3/8 inch (10 mm) and not more than 3/4 inch (19 mm).
b. Apply elastomeric sealants, in joints not subject to traffic or other abrasion, to a depth equal to 50% of the joint width, but not less than 1/4 inch (6 mm) and not more than 1/2 inch (13 mm).
c. Apply non-elastomeric sealants to a depth approximately equal to the joint width.
d. Fill horizontal traffic bearing joints slightly recessed to avoid direct contact with wheel, and pedestrian traffic. Fill horizontal traffic bearing joints with slope grade polyurethane sealants to a depth approximately equal to the joint width.

2. Pour self leveling sealants to a depth approximately equal to the joint width.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform, beads to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces. Tool exposed surfaces of sealants to the profile shown, or if none is shown, tool slightly concave.

1. Use masking tape to protect adjacent surfaces of recessed tooled joints.
2. Provide a slight wash on horizontal joints where horizontal and vertical surfaces meet.
3. Against rough surfaces or in joints of uneven widths avoid the appearance of excess sealant or compound by locating the compound or sealant well back into joint wherever possible.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field-test exterior wall joint-sealant adhesion to joint substrates as follows:

1. Perform 10 tests for the first 1000 feet (300 m) of joint length for each type of exposed exterior wall sealant and joint substrate.

B. Field adhesion testing of sealants shall take place in the presence of a qualified technical representative of the sealant manufacturer.

1. Test Method: Test joint sealants by hand-pull method described below:

a. Make knife cuts from one side of joint to the other, followed by two cuts approximately 3 inches (75 mm) long at sides of joint and meeting cross cut at one end. Place a mark 1 inch (25 mm) from cross-cut end of 3 inch (75 mm) piece.
b. Use fingers to grasp 3 inch (75 mm) piece of sealant between cross-cut end and 1 inch (25 mm) mark; pull firmly at a 90-degree angle to the joint in the direction of side cuts and hold the sealant in this position for 10 seconds; following the 10 second time duration pull sealant at a 180 degree angle parallel to the joint and hold the sealant in this position for 10 seconds. Pull sealant away from joint to the distance recommended by sealant manufacturer for testing adhesion.

c. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.

2. The sealant manufacturer's qualified technical representative shall record test results, and observations of joint and sealant conditions, in a field adhesion test log.
3. Repair joint sealants pulled from test area as recommended by sealant manufacturer.
4. The sealant manufacturer shall provide written documentation of changes in product and/or application method required to address sealant failure, observe and document retesting as required by the Architect, and provide a written statement of compliance with applicable warranties.

C. Sealants not evidencing adhesive failure from testing will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 07 92 00
07 92 00/05-07/ttt

SECTION 08 11 13 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes steel doors and frames.

1.2 ACTION SUBMITTALS

A. Product Data: Submit product data for each product indicated. Include material descriptions, core descriptions, label compliance, sound and fire-resistance ratings, and finishes for each type of door and frame specified.

B. Shop Drawings: Submit door and frame schedule using same reference designations indicated on Drawings. Include opening size(s), handing of doors, frame throat dimensions, details of each frame type, elevations of door design types, details of construction, location and installation requirements of door hardware and reinforcements, hardware group numbers, details of joints and connections, fire label requirements including fire rating time duration, maximum temperature rise requirements, and smoke label requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Certificate of Compliance for Fire Rated Doors: Provide copies of Certificate of Compliance for all fire rated door assemblies, all smoke and draft control door assemblies, and all temperature rise rated door assemblies.

1.4 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with the applicable provisions and recommendations of the following publications by Hollow Metal Manufacturers Association (HMMA) Div. of National Association of Architectural Metal Manufacturers (NAAMM), unless more stringent requirements are indicated in the Contract Documents:

1. HMMA "Hollow Metal Manual."
2. HMMA 861 "Guide Specifications for Commercial Hollow Metal Doors and Frames."

B. Manufacturer Qualifications: A firm experienced in manufacturing steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Provide metal labels permanently fastened on each door which is within the size limitations established by the labeling authority having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and Project site storage.

B. Inspect doors and frames, on delivery, for damage. Tool marks, rust, blemishes, and any other damage on exposed surfaces will not be acceptable. Remove and replace damaged items as directed by Architect. Store doors and frames at building site in a dry location, off the ground, and in such a manner as to prevent deterioration.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide doors and frames by one of the following:

1. Steel Doors and Frames:

a. Ceco Door Products.
b. Curries Company.
c. Steelcraft; a division of Ingersoll-Rand.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, CS (commercial steel), Type B; free of scale, pitting, or surface defects; pickled and oiled. Not less than 0.053 inch (1.3 mm) thick where frames are indicated to be built into exterior walls, hot dip galvanize after fabrication in compliance with ASTM A153/A153M, Class B.

B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, CS (commercial steel), and ASTM A 568/A 568M, free from scale, pitting, coil breaks, or other defects, exposed (matte) dull finish.

C. Metallic-Coated Steel Sheets: ASTM A924/A924M and ASTM A 653/A 653M, CS (commercial steel), Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating, mill phosphatized.

D. Inserts, Bolts, and Fasteners: Galvanized or cadmium plated steel.

1. Expansion Bolts and Shields: FS FF-S-325, Group III, Type 1 or 2.
2. Machine Screws: FS FF-S-92, carbon steel, Type III cross recessed, design I or II recess, style 2C flat head.

E. Power-Actuated fasteners I Concrete: fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

G. Filler: Sound deadening and heat retarding mineral fiber insulating material.

H. Glass and Glazing: refer to Division 08 Section"Glazing".

2.3 DOORS

A. General: Provide flush-design doors, 1-3/4 inches (44 mm) thick, of seamless hollow construction, unless otherwise indicated. Construct doors with sheets joined at their vertical edges by continuous welding the full height of the door, with no visible seams on their faces or vertical edges, and all welds ground and finished flush.

1. Visible joints or seams around glazed or louvered panel inserts are permitted.
2. For single-acting swing doors, bevel both vertical edges 1/8 inch in 2 inches (3 mm in 50 mm).
3. For double-acting swing doors, round vertical edges with 2-1/8 inch (54 mm) radius.

B. Core Construction: Provide one of the following core constructions welded to both door faces:

1. Steel-Stiffened Core: 0.032 inch (0.8 mm) steel vertical stiffeners extending full-door height, spaced not more than 6 inches (150 mm) apart and spot welded to face sheets a maximum of 5 inches (127 mm) o.c. Place filler between stiffeners for full height of door.
2. Continuous Truss-Form Inner Core: 0.013 inch (0.33 mm) thick steel reinforcement spot welded to face sheets a maximum of 2-3/4 inches (69.9 mm) o.c. vertically and horizontally.

C. Fire Door Cores: A continuous mineral fiberboard core permanently bonded to the inside face of the outer face sheet unless otherwise required to provide fire-protection and temperature-rise ratings indicated.

D. Astragals: As required by NFPA 80 to provide fire ratings indicated.

E. Top and Bottom Channels: Spot weld metal channel not less than thickness of face sheet to face sheets not more than 6 inches (150 mm) o.c.

1. Reinforce tops and bottoms of doors with inverted horizontal channels of same material as face sheet so flanges of channels are even with bottom and top edges of face sheets.
2. For exterior doors, close bottom edge with metallic-coated steel closing channel and top edge with filler channel of same material, so webs of channels are flush with bottom and top door edges. Weld inverted steel channels to both face sheets or form integrally with edge construction of door.

F. Hardware Reinforcement: Fabricate reinforcing from the same material as door to comply with the following. Offset reinforcement so that faces of mortised hardware items are flush with door surfaces.

1. Hinges and Pivots: 0.167 inch (4.2 mm) thick by 1-1/2 inches (38 mm) wide by 9 inches (229 mm).
2. Lock Front, Strike, and Flushbolt Reinforcements: 0.093 inch (2.3 mm) thick by size as required by hardware manufacturer.
3. Lock Reinforcement Units: 0.067 inch (1.7 mm) thick by size as required by hardware manufacturer.
4. Closer Reinforcements: 0.093 inch (2.3 mm) thick one-piece channel by size as required by hardware manufacturer.
5. Other Hardware Reinforcements: As required for adequate strength and anchorage.
6. In lieu of reinforcement specified, hardware manufacturer's recommended reinforcing units may be used.
7. Exit Device Reinforcements: 0.250 inch (6.35 mm) thick by 10 inches (245 mm) high by 4 inches (101 mm) wide centered on exit device case body, unless otherwise recommended by exit device manufacturer.

G. Interior Steel Doors:

1. Typical Interior Doors: Flush design with 0.042 inch (1.06 mm) thick cold-rolled stretcher-leveled steel face sheets and other metal components from hot- or cold-rolled steel sheets.
2. Extra Heavy Use Doors: Flush design with 0.067 inch (1.7 mm) thick cold-rolled, stretcher-leveled steel face sheets and other metal components from hot- or cold-rolled steel sheets. Provide only where indicated.

H. Exterior Steel Doors: Flush design with 0.053 inch (1.3 mm) thick metallic-coated stretcher leveled steel face sheets and other metal components from metallic coated steel sheets. Provide weep-hole openings in bottom of doors to permit entrapped moisture to escape.

2.4 FRAMES

A. Fabricate steel door frames, formed to profiles indicated, with full 5/8 inch (16 mm) stops, and of the following minimum thicknesses.

1. For exterior use, form frames from 0.067 inch (1.7 mm) thick, metallic-coated steel sheets.
2. For interior use, form frames from cold- rolled steel sheet of the following thicknesses:

   a. Openings up to and Including 48 inches (1200 mm) Wide: 0.053 inch (1.3 mm).
   b. Openings More Than 48 inches (1200 mm) Wide: 0.067 inch (1.7 mm).

B. Provide frames either saw mitered and full (continuously) welded, or machine mitered and full welded, on back side at frame corners and stops with edges straight and true. Grind welds smooth and flush on exposed surfaces.

C. Hardware Reinforcement: Fabricate reinforcements from same material as frame to comply with the following. Offset reinforcement so that faces of mortised hardware items are flush with surface of the frame.

1. Hinges and Pivots: 0.167 inch (4.2 mm) thick by 1-1/4 inches (32 mm) wide by 10 inches (254 mm).
2. Strike, Surface Mounted Hold Open Arms, and Flushbolt Reinforcements: 0.093 inch (2.3 mm) thick by size as required by hardware manufacturer.
3. Closer Reinforcements: 0.093 inch (2.3 mm) thick one piece channel by size as required by hardware manufacturer.
4. Other Hardware Reinforcements: As required for adequate strength and anchorage.

D. Jamb Anchors: Locate jamb anchors above hinges and directly opposite on strike jamb as required to secure frames to adjacent construction. At metal stud partitions locate the additional jamb anchor below the top hinge.

1. Masonry Construction: Adjustable, corrugated or perforated, anchors to suit frame size; formed of same material and gauge thickness as frame; at non-rated frames use friction fit T-shaped anchors, at rated frames use anchors consisting of spot welded strap and adjustable anchor; with leg not less than 2 inches (50 mm) wide by 10 inches (250 mm) long. Furnish at least the number of anchors per jamb according to the following frame heights:

    a. Two anchors per jamb up to 60 inches (1500 mm) in height.
    b. Three anchors per jamb from 60 to 90 inches (1500 to 2250 mm) in height.
    c. Four anchors per jamb from 90 to 96 inches (2250 to 2400 mm) in height.
    d. One additional anchor per jamb for each 24 inches (600 mm) or fraction thereof more than 96 inches (2400 mm) in height.

2. Metal-Stud Partitions: Metal channel stud zee anchor sized to match stud width, welded to back of frames, formed of same material and gauge thickness as frame. Provide at least the number of anchors for each jamb according to the following heights:

    a. Three anchors per jamb up to 60 inches (1500 mm) in height.
    b. Four anchors per jamb from 60 to 90 inches (1500 to 2250 mm) in height.
    c. Five anchors per jamb from 90 to 96 inches (2250 to 2400 mm) in height.
    d. One additional anchor per jamb for each 24 inches (600 mm) or fraction thereof more than 96 inches (2400 mm) in height.

3. In-Place Concrete or Masonry: Anchor frame jambs with minimum 3/8 inch (9 mm) diameter countersunk flat head bolts into expansion shields or inserts 6 inches (150 mm) from top and bottom of each jamb with intermediate anchors spaced a maximum of 26 inches (650 mm) o.c. Soffit face of frame shall be punched and dimpled to accept countersunk bolt head. Reinforce frame with spacer to prevent bowing. Bolt head shall be set slightly below soffit face, filled and ground smooth at time of installation.

E. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, formed of same material as frame, 0.093 inch (2.3 mm) thick, and punched with two holes to receive two (2) 0.375 inch (9.5 mm) fasteners. Where floor fill or setting beds occur support frame by adjustable floor anchors bolted to the structural substrate. Terminate bottom of frames at finish floor surface.

F. Head Strut Supports: Provide 3/8-by-2 inch (9-by-50 mm) vertical steel struts extending from top of frame at each jamb to supporting construction above. Bend top of struts to provide flush contact for securing to supporting construction above by bolting, welding, or other suitable anchorage. Provide adjustable wedged or bolted anchorage to frame jamb members to permit height adjustment during installation. Adapt jamb anchors at struts to permit adjustment.

G. Head Reinforcement: For frames more than 48 inches (1200 mm) wide in masonry wall openings, provide continuous steel channel or angle stiffener, 0.093 inch (2.3 mm) thick for full width of opening, welded to back of frame at head. Head reinforcements shall not be used as a lintel or load-bearing member for masonry.

H. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions to serve as bracing during shipment and handling and to hold frames in proper position until anchorage and adjacent construction have been completed.

I. Door Silencer Holes: Drill strike jamb stop to receive three silencers on single door frames and for two silencers on double door frames. Insert plastic plugs in holes to keep holes clear during installation.

J. Plaster Guards and Removable Access Plates: Provide 0.016 inch (0.4 mm) thick plaster guards or dust-cover boxes of same material as frame, welded to frame at back of hardware cutouts to close off interior of openings and prevent mortar or other materials from obstructing hardware operation. Provide removable access plates in the heads of frames to receive overhead concealed door closers.

2.5 STOPS AND MOLDINGS

A. Provide continuous stops and moldings around solid, glazed, and louvered panels where indicated.

B. Form fixed stops and moldings integral with frame, on the exterior (non-secured) side of the frame.

C. Provide removable stops and moldings formed of 0.032 inch (0.8 mm) thick steel sheets matching steel frames. Secure with countersunk oval head machine screws spaced uniformly not more than 12 inches (300 mm) o.c. Form corners with butted hairline joints.

D. Coordinate rabbet width between fixed and removable stops with type of glass or panel and type of installation indicated.

2.6 FABRICATION

A. Fabricate doors and frames rigid, neat in appearance, and free of defects, warp, wave, and buckle. Accurately form metal to sizes and profiles indicated. Accurately machine, file, and fit exposed connections with hairline joints. Weld exposed joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

B. Exposed Fasteners: Provide countersunk flat heads for exposed screws and bolts, unless otherwise indicated.

C. Hardware Preparation: Prepare doors and frames to receive hardware, including cutouts, reinforcement, mortising, drilling, and tapping, according to final hardware schedule and templates provided by hardware supplier. Secure reinforcement by spot welding. Comply with applicable requirements of ANSI A115 Series specifications for door and frame preparation for hardware. Factory-reinforce doors and frames to receive surface-applied hardware. Factory drill and tap for surface-applied hardware, except at pushplates and kickplates provide reinforcing only.

1. Locate hardware as indicated on the drawings or in Division 08 Section "Door Hardware" or, if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."

2.7 STEEL SHEET FINISHES

A. General: Clean, treat and prime surfaces of fabricated steel door and frame work, inside and out, whether exposed or concealed in the construction.

B. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale, shavings, filings, and rust, if present, complying with SSPC-SP 3, "Power Tool Cleaning."

C. Factory Priming for Field-Painted Finish: Apply shop primer immediately after surface preparation and pretreatment. Apply a sufficient number of coats, baked on, to obtain uniformly smooth exposed surfaces. Touch up surfaces having runs, smears, or bare spots.

1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, corrosion-inhibiting, lead- and chromate-free, universal primer complying with ANSI A250.10 acceptance criteria; compatible with substrate and field-applied finish paint system indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install doors and frames according to DHI A115.IG, the Architect reviewed shop drawings, and manufacturer's written recommendations and installation instructions.

B. Frames: Install frames where indicated. Extend frame anchorages below fills and finishes. Coordinate the installation of built-in anchors for wall and partition construction as required with other work.
1. Welded Frames:

a. Set masonry anchorage devices where required for securing frames to in-place concrete or masonry construction.

1) Set anchorage devices opposite each anchor location as specified and anchorage device manufacturer's written instructions. Leave drilled holes rough, not reamed, and free of dust and debris.

b. Placing Frames: Set frames accurately in position; plumb; align, and brace securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1) At concrete or masonry construction, set frames and secure in place with machine screws and masonry anchorage devices. Anchor bottom of frames to floors with anchor bolts or power driven fasteners.
2) Field splice only at approved locations indicated on the shop drawings. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.
3) Remove spreader bars only after frames are properly set and secured.

2. At fire-rated openings, install frames according to NFPA 80.
3. Existing Frames (Salvaged from Alteration Work): Install salvaged existing frames in locations indicated.

C. Doors:

1. Non-Fire Rated Doors: Fit non-fire-rated doors accurately in their respective frames, with the following clearances:

a. Jambs and Head: 3/32 inch (2 mm).
b. Meeting Edges, Pairs of Doors: 1/8 inch (3 mm).
c. Bottom: 3/8 inch (9 mm), if no threshold or carpet.
d. Bottom: 1/8 inch (3 mm), at threshold or carpet.

2. Fire-Rated Doors: Install with clearances as specified in NFPA 80.
3. Smoke Control Doors: Install according to NFPA 105.
4. Existing Doors (Salvaged from Alteration Work): Install salvaged existing doors in locations indicated.

D. Wood Door Installation: Refer to Division 08 Section "Flush Wood Doors."

E. Apply hardware in accordance with hardware manufacturer's instructions and Division 08 Section "Door Hardware." Drill and tap for machine screws as required. Do not use self tapping sheet metal screws. Adjust door installation to provide uniform clearance at head and jambs, and to contact stops uniformly. Adjust hardware items just prior to final inspection. Leave work in complete and proper operating condition.

3.2 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items just before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames that are warped, bowed, or otherwise unacceptable.

B. Prime-Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

1. Finish Painting: Refer to Division 09 Section "Painting."

C. Remove and replace defective work, including doors or frames that are warped, bowed, or otherwise defective.

D. Institute protective measures required throughout the remainder of the construction period to ensure that steel doors and frames will be without any damage or deterioration, at time of substantial completion.

END OF SECTION 08 11 13
08110/5-98/ttt

SECTION 08 12 16 – ALUMINUM FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes extruded aluminum frames for doors, and glazed openings, for interior locations:

B. Related Sections:

1. Division 08 Section "Flush Wood Doors" for doors to be installed into aluminum frames.
2. Division 08 Section "Door Hardware" for door hardware and gasketing.

1.2 ACTION SUBMITTALS

A. Product Data: For each product indicated. Include frame designation, type, level and model, material description

B. Shop Drawings: Indicate frame throat dimensions, details of each frame type, elevations of door design types, details of construction; location and installation requirements of door hardware and reinforcements, hardware group numbers; details of joints and connections; and finishes.

C. Samples: For each type of corner construction and each type of exposed finish required. Prepare samples from same material to be used for the Work.

D. Door and Frame Schedule. Use same reference designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer, with not less than five years experience, who has completed interior aluminum framing systems similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations: Obtain aluminum frames through one source from a single manufacturer with the capacity and resources to provide products of consistent quality in appearance and physical properties.

C. Product Options: Drawings indicate dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining

construction dimensions. Other manufacturers' products complying with requirements may be considered. Refer to Division 01 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect doors and frames from damage during transit, job storage, and installation.

B. Inspect frames on delivery for damage. Tool marks, rust, blemishes and any other damage on exposed surfaces will not be acceptable. Remove and replace damaged items that cannot be repaired as directed by Architect. Store frames at building site in a dry location, off the ground, and in such a manner as to prevent deterioration.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Base of Design is Raco Interior Products, Inc Houston, TX. Design, Solutions II System. Products by one of the following manufacturers, similar to those described in the specifications and indicated on the drawings may be considered and is subject to acceptance of the Architect:
1. Custom Components Co. Inc., Tampa FL.
2. Wilson Partitions, Inc.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M) alloy 6063-T5 or alloy and temper required to suit structural and finish requirements.

B. Recycled Content of Aluminum Products: Provide products with an average recycled content so that post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 45 percent.

2.3 COMPONENTS

A. General: Provide interior aluminum frame components that comply with dimensions, profiles, and relationships to adjoining work of components indicated on Drawings.

B. Door Frames: Extruded aluminum, not less than 0.062 inch (1.6 mm) thick, reinforced for hinges and strikes with 0.125 inch (3.2 mm) thick hinge back up plates.

C. Glass Frames: Extruded aluminum, not less than 0.062 inch (1.6 mm) thick, designed for glass thickness indicated.

D. Trim: Extruded aluminum, not less than 0.062 inch (1.6 mm) thick, without exposed fasteners.

2.4 ACCESSORIES

A. Fasteners: Aluminum, nonmagnetic stainless-steel or other non-corrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.

B. Glazing Gaskets: Manufacturer's standard extruded or molded plastic, to accommodate 6-mm thick glass.

C. Glazing: As specified in Division 08 Section "Glazing."

D. Hardware: As specified in Division 08 Section "Door Hardware."

E. Gaskets/ Silencers:

1. Door Openings: Provide vinyl or pile continuous gasket/silencer in Architect's choice of white, gray, or black.
2. Glazed Units: Provide continuous vinyl gasket in Architect's choice of white, gray, or black.

2.5 FABRICATION

A. Fabricate all components to allow secure installation without exposed fasteners.

B. Fabricate frames with butt, mitered, or coped and continuously welded corners and seamless face joints. Provide concealed corner reinforcements and alignment clips for precise butt or mitered connections.

C. Prepare frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier.

D. Reinforce frames to receive surface-applied hardware. Machine jambs and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required, and fastened within frame with concealed screws.

E. Locate hardware as indicated.

F. Provide terminated stops.

G. Door Silencers: Continuous gasket at frame head and both jambs.

H. Fabricate frames for glass to allow glass replacement without dismantling frame.

I. Glazing Stops: Provide non-removable stops on secure side of interior doors for glass, louvers, and other panels in doors. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.

J. Clearances for Non-Fire-Rated Door Frames: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between pairs of doors. Not more than 3/4 inch (19 mm) at bottom.

2.6 ALUMINUM FINISHES

A. Anodic Finish: Class I, clear, complying with AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install frames plumb and square, securely anchored to substrates with fasteners recommended by frame manufacturer.

B. Install partition components in the longest possible lengths; components up to 48 inches (1200 mm) long must be one piece. Fasten to suspended ceiling grid on maximum 48 inch (1200 mm) centers, using sheet metal screws or other fasteners approved by frame manufacturer.

1. Use concealed installation clips to ensure that splices and connections are tightly butted and properly aligned.
2. Secure clips to main structural extrusion components and not to snap-in or trim members.
3. Do not leave screws or other fasteners exposed to view when installation is complete.

C. After installation, remove protective wrappings from frames. Refinish or replace frames damaged during installation. Touch up marred areas so touchup is not visible from a distance of 48 inches (1200 mm). Remove and replace frames that cannot be refinished to satisfaction of the Architect.

END OF SECTION 08 12 16
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SECTION 08 14 16 – FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes solid core flush wood doors.

1. The integration of a security system into the flush wood door work is required. The Contractor shall be responsible for the total and complete coordination of the security system components into the Work.

1.2 ACTION SUBMITTALS

A. Product Data: Submit product data for each type of door required, including details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

1. Submit laboratory test report results of hinge loading, cycle/slam, stile edge screw withdrawals, and stile edge split resistance for fire rated doors.

B. Shop Drawings: Submit shop drawings indicating location, size, thickness, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; undercuts, special beveling, and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware of factory machined doors.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire label requirements including fire rating time duration, maximum temperature rise requirements, and smoke label requirements.
6. Indicate routing of electrical conduit and dimensions and locations of cutouts in wood doors to accept electric hardware devices.

C. Samples: Submit samples of the following:

1. Cut away corner section of each door type approximately 8 by 10 inches (200 by 250 mm) demonstrating door construction, face veneer and finish.
2. Louver blade and frame sections, 6 inches (150 mm) long, for each material and finish specified.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with the applicable provisions and recommendations of AWI's "Architectural Woodwork Quality Standards Illustrated, 8th Edition, Version 2.0, Section 1300" where standards and specifications conflict the more stringent shall be required.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect wood doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Store wood doors on a flat level surface in a dry, well ventilated, place. Keep wood doors a minimum of 3-1/2 inches off floor surface and protected by a protective covering under the bottom door and over the top door. Covering should protect wood doors from dirt, water and abuse but allow for air circulation under and around the stack. Do not store wood doors in direct sunlight. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in heavy duty cardboard cartons prior to shipment from factory. Mark each door on top and bottom rail with opening number used on Shop Drawings using temporary, removable, or concealed markings.

C. Handle wood doors with clean gloves. Lift and carry wood doors when moving them around the site, do not drag wood doors across one another.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work, such as masonry, concrete, stone, tile, terrazzo, plastering, wallboard joint treatment, is complete and dried, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period. Do not expose doors to sudden changes in temperature such as forced heat used to dry out the site.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship for the life of the original installation of the door. A representative of the door manufacturer shall inspect the installed doors and shall note on the warranty that no provisions of the warranty have been nullified in the manufacture and/or installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Flush Wood Door Manufacturers: Subject to compliance with requirements, provide flush wood door products by one of the following:

1. Algoma Hardwoods Inc.
2. Eggers Industries; Architectural Door Division.
3. Marshfield Door Systems, Inc. (formally Door Division of Weyerhaeuser Company).

2.2 DOOR CONSTRUCTION, GENERAL

A. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2 , made with binder containing no urea-formaldehyde resin.

B. Doors for Transparent Finish:

1. Grade: Premium, with Grade AA faces.
2. Species and Cut: Maple.
3. Match between Veneer Leaves: Book match.
4. Assembly of Veneer Leaves on Door Faces: Center balance match.
5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
6. Room Match: Match door faces within each separate room or area of building. Corridor faces do not need to match where they are separated by 20 feet or more.
7. Thickness: 1-3/4 inch (45 mm) unless otherwise indicated.
8. Stiles: Same species as faces.

2.3 SOLID-CORE DOORS

A. Particleboard Cores: Comply with the following requirements:

1. Particleboard: ANSI A208.1, Grade 1-LD-2.

a. Use particleboard made with binder containing no urea-formaldehyde resin.

2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware, as follows:

a. 5 inch (125 mm) top-rail blocking, in doors indicated to have closers.
b. 5 inch (125 mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.

3. Provide doors with either glued-block or structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated.
4. Vertical Edges: 1-3/8 inch wide minimum prior to fitting, 2 ply laminated wood construction consisting of a single piece hardwood outer band, without fingerjoints, and an inner band of mill option hardwood. Outer band to match face veneer for transparent finished veneered-faced doors.
5. Crossbanding: Minimum 1/16 inch thick, low density hardwood, composite, or high density hardboard.

B. Veneer-Faced Door Construction: AWI Section 1300, PC-5 ME.

1. Core: Particleboard.
2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

3. Crossbanding materials shall extend full width of door with grain running horizontally, tapeless spliced without voids or show through (telegraphing), and directly glued to core and blocking.
4. Sand cross banding before application of face veneer.
5. Face veneer shall extend full height of door with grain running vertically, tapeless spliced without voids or show through (telegraphing), and directly glued to cross band.
6. Glue lines between face veneer, crossbanding, and blocking shall be of a type to comply with the specified warranty using the hot plate process.

2.4 LOUVER FRAMES

A. Wood Louvers: Door manufacturer's standard vision proof inverted V-slat, or sightproof chevron, solid-wood louvers matching veneer species of door faces. Provide wood louvers with manufacturer's standard flush designed, solid wood, rectangular shaped, beads matching veneer species of door faces. Include finish nails for removable stops sized in accordance with wood door manufacturer's recommendations.

2.5 FABRICATION

A. Fabricate doors in sizes indicated for Project-site fitting.

B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, AWI Section 1300-G-20, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required. Install light and louver beads with fasteners spaced for opening size and fire rating indicated. Install wood bead moldings with finish nails and countersink without striking bead. Fill countersunk heads with putty matching wood bead color.

2.6 FACTORY FINISHING

A. Finish doors at factory that are indicated to receive transparent finish.

B. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. General: Comply with the referenced quality standard for factory finishing.

D. Transparent Finish:

1. Grade: Premium.
2. Finish: Manufacturer's standard finish with performance meeting or exceeding the performance of either AWI System TR-4 conversion varnish, or AWI System TR-6 catalyzed polyurethane.
3. Staining: Prepare door faces, stiles, rails, and cutouts, with toners, or stains, prior to the application of finish to match Architect's sample.
4. Effect: Open-grain finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: Apply hardware to doors in accordance with hardware manufacturer's instructions and Division 08 Section "Door Hardware." For particleboard core doors drill pilot holes of proper size for installing hinge screws. Adjust hardware items just prior to final inspection. Leave work in complete and proper operating condition.

1. Factory wrapping shall be maintained on new doors during construction period, and all hardware shall be installed by cutting the factory wrapping at the mounting location of the hardware item.

B. General Door Installation Standards: Install doors in locations indicated to comply with manufacturer's written instructions, referenced quality standard, and as indicated. Where standards conflict the more stringent shall apply.

1. Install fire-rated doors in corresponding fire-rated frames according to fire label requirements.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge, matching clearances specified for factory prefitting, and to contact stops uniformly. Field cutting, fitting or trimming, if required, shall be executed in a workmanlike manner.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING AND PROTECTION

A. Rehang or replace doors that do not swing or operate freely.

B. Protection: Protect wood doors to ensure that the wood door work will be without damage or deterioration at the time of Substantial Completion.

1. Refinish or replace wood doors damaged during installation. Replace any new wood doors that are warped, twisted, demonstrate core show through, are not true in plane, or cannot be refinished to the satisfaction of the Architect.

END OF SECTION 08 14 16
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SECTION 08 30 00 – HIGH SPEED ROLLING DOOR

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. High-speed roll-up doors.

B. Wiring from electric circuit disconnect to operator to control station.

1.02 RELATED SECTIONS

A. None

1.03 REFERENCES

A. NEMA - National Electrical Manufacturers Association.

B. LED - Light Emitting Diode.

1.04 SYSTEM DESCRIPTION

A. Motor type: AC drive, and variable speed with soft acceleration and braking. Mechanical release lever on side column allows door to be easily opened in the event of a power failure.

1.05 SUBMITTALS

A. Submit the following:

1. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

2. Product Data: Provide general construction, component connections and details, and electrical equipment, operation instructions, and information.

3. Samples: Submit samples of door slat material.

4. Manufacturer's Installation: Indicate installation sequence and procedures, adjustment, and alignment procedures.

1.06 MAINTENANCE DATA

A. Maintenance Data: Cycle-Plus™ Scheduled Maintenance Program to be included indicating lubrication requirements and frequency, periodic adjustments required, scheduled maintenance suggested, manufacturers data sheets, and equipment inter-connection diagrams.

1.07 REGULATORY REQUIREMENTS

A. Electrical control panel NEMA approved.

1.08 QUALITY ASSURANCE

A. Furnish high-speed roll doors and all components and accessories by one manufacturer.

1.09 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on shop drawings.

1.10 COORDINATION

A. Coordinate the work with installation of electric power and locations and sizes of conduit.

1.11 WARRANTY

A. One year parts, one year labor.

PART 2 - PRODUCTS

2.01 PRODUCTS

A. Rytec Corporation Spiral FV Door.

B. No substitutions permitted.

2.02 MATERIALS

A. Door Panel: Aluminum slat frames with clear polycarbonate windows are 9 inches high by 1-3/16 inches thick. Integral rubber weatherseal between each of the panels.

B. Side Frames: Galvanized steel side frames with full height weatherseal on both sides to seal against door panel. Dual thru-beam photo-eyes standard. No exterior mounted coil cord.

C. Bottom Bar: Extruded aluminum bottom bar with electric, reversing edge that reverses the door upon contacting an object.

D. Counterbalance: Up to three extension springs in each side column, depending on the size of the door. Springs assist the motor in opening the door. Mechanical release lever on side column allows door to be easily opened in the event of a power failure. Doors with springs located within the barrel will not be accepted.

E. Drive system: 2 HP 208, 230/460 Volt, three-phase motor with variable-speed AC drive which allows for soft acceleration and deceleration.

F. Travel Speed: Opens at up to 100 inches per second.

G. Electrical Controls: System 3 door controller, housed in a Nema 4 rated enclosure with factory set parameters. Self- diagnostic features and a two-line, 32-character LCD display provide quick and straightforward installation and control adjustments. Programmable inputs and outputs accommodate special control applications without the need for additional electrical components.

Control panels that require a portable computer unit, additional components or other devices for programming and/or troubleshooting will not be accepted.

H. Door to use rotary encoder to regulate door travel limits. Limits to be self-adjusting without the use of tools from floor level at the control panel. Doors using mechanical limits switches or doors that require tools to set the limits will not be accepted.

I. All components factory finished.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances, and conditions are acceptable.

3.02 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Fit and align assembly including hardware; level to plumb to provide smooth operation.

D. Coordinate installation of electrical service. Complete wiring from disconnect to unit components.

3.03 ADJUSTING

A. Adjust door and operating assemblies.

B. Test and adjust door(s), if necessary, for proper operation.

3.04 CLEANING

A. Clean door and components.

SECTION 08 36 13 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes electrically operated sectional doors.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Delegated Design: Design sectional doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Performance: Exterior sectional doors shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to local Code requirements or below whichever is more restrictive..

1. Wind Loads: 30 lbf/sq. ft., acting inward and outward.

2. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components. Deflection of door in horizontal position (open) shall not exceed 1/120 of the door width.

D. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E 283.

1. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. at 25 mph .

E. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to requirements of local Code.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

F. Operation Cycles: Provide sectional door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory. Include the following:

1. Construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

3. Include similar Samples of accessories involving color selection.

C. Samples: For each type of exposed product and for each color and texture required

D. Delegated-Design Submittal: For sectional doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Summary of forces and loads on walls and jambs.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Seismic Qualification Certificates: For sectional doors**,** accessories, and components, from manufacturer.

C. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Standard for Sectional Doors: Fabricate sectional doors to comply with DASMA 102 unless otherwise indicated.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ALUMINUM DOOR SECTIONS

A. Sections: Construct door sections with stiles and rails formed from extruded-aluminum shapes, complying with ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and finish indicated, with wall thickness not less than 0.065 inch (1.7 mm) for door section 1-3/4 inches (44 mm) deep. Fabricate sections with stile and rail dimensions and profiles shown on Drawings. Join stiles and rails by welding or with concealed, 1/4-inch- (6-mm-) minimum diameter, aluminum or nonmagnetic stainless-steel through bolts, full height of door section. Form meeting rails to provide a weathertight-seal joint.

1. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Ensure that reinforcement does not obstruct vision lites.
2. Provide reinforcement for hardware attachment.

B. Full-Vision Sections: Manufacturer's standard, tubular, aluminum-framed section fully glazed with 6-mm-thick, insulating glass set in vinyl, rubber, or neoprene glazing channel and with removable extruded- aluminum stops.

2.2 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances shown on Drawings, and complying with ASTM A 653/A 653M for minimum G60 (Z180) zinc coating. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type and size. Slot vertical sections of track spaced 2 inches (51 mm) apart for door-drop safety device. Slope tracks at proper angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.

B. Track Reinforcement and Supports: Galvanized-steel track reinforcement and support members, complying with ASTM A 36/A 36M and ASTM A 123/A 123M. Secure, reinforce, and support tracks as required for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.

1. Vertical Track Assembly: Track with continuous reinforcing angle attached to track and attached to wall with jamb brackets.
2. Horizontal Track Assembly: Track with continuous reinforcing angle attached to track and supported at points from curve in track to end of track by laterally braced attachments to overhead structural members.

C. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.

D. Windows: Manufacturer's standard window units of type and size indicated and in arrangement shown. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors, as required. Provide removable stops of same material as door-section frames.

2.3 HARDWARE

A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Heavy-duty, galvanized-steel hinges according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- (76-mm-) diameter roller tires for 3-inch- (76-mm-) wide track and 2-inch- (51-mm-) diameter roller tires for 2-inch- (51-mm-) wide track.

2.4 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Provide cylinders specified in Section 087100 "Door Hardware".
2. Keys: Three for each cylinder.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.5 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion

shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.

B. Cable Drums and Shaft for Doors: Cast-aluminum or gray-iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft. Provide one additional midpoint bracket for shafts up to 16 feet (4.88 m) long and two additional brackets at one-third points to support shafts more than 16 feet (4.88 m) long unless closer spacing is recommended by door manufacturer.

C. Cables: Galvanized-steel lifting cables with cable safety factor of at least [**5**] [**7**] to 1.

D. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

E. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

F. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

2.6 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.

1. Trolley: Trolley operator mounted to ceiling above and to rear of door in raised position and directly connected to door with drawbar.

D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 110513 "Common Motor Requirements for Equipment" unless otherwise indicated.

1. Electrical Characteristics to be coordinated with electrical drawings.

2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
3. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system .

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensor device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.

2. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

a. Self-Monitoring Type: Device designed to interface with door-operator control circuit to detect damage to or disconnection of sensor edge.

G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."

1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.7 DOOR ASSEMBLY

A. Aluminum Full-Vision Aluminum Sectional Door: Sectional door formed with hinged sections.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Wayne Dalton 452Full View Sectional Door or comparable product by one of the following:
      a. Overhead Door Corporation.
      b. Raynor.
      c. Wayne-Dalton Corp.

B. Operation Cycles: Not less than 20,000 cycles and 25 cycles per day.

C. Installed R-Value: 12.0 deg F x h x sq. ft./Btu (2.113 K x sq. m/W).

D. Aluminum Sections: Full vision.

E. Track Configuration: High-lift track.

F. Weatherseals: Fitted to bottom and top and around entire perimeter of door. Provide combination bottom weatherseal and sensor edge.

G. Windows: Approximately as shown on drawings, with square corners, installed with insulated glazing of the following type:

   1. Clear Float Glass: 3 mm thick and complying with ASTM C 1036, Type I, Class 1, Quality Q3.
   2. Insulating Glass: Manufacturer's standard.

H. Roller-Tire Material: Manufacturer's standard.

I. Locking Devices: Equip door with locking device assembly.

   1. Locking Device Assembly: Cremone type, both jamb sides, locking bars, operable from inside and outside, with cylinders.

J. Counterbalance Type: Torsion spring.

K. Manual Door Operator: Chain-hoist operator.

L. Electric Door Operator:

   1. Usage Classification: Standard duty, up to 60 cycles per hour Medium duty, up to 15 cycles per hour Light duty, up to 10 cycles per hour Insert classification.
   2. Operator Type: Trolley.
   3. Motor Exposure: Interior, clean, and dry.
   4. Emergency Manual Operation: Chain type.
   5. Obstruction-Detection Device: Automatic photoelectric sensor; self-monitoring type.

a. Sensor Edge Bulb Color: Black.

6. Remote-Control Station: Interior.
7. Other Equipment: Audible and visual signals.

M. Door Finish:

1. Aluminum Finish: Clear anodized.
2. Finish of Interior Facing Material: Match finish of exterior section face.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Tracks:

1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches (610 mm) apart.
2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
3. Repair galvanized coating on tracks according to ASTM A 780.

C. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.3 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust doors and seals to provide weathertight fit around entire perimeter.

D. Align and adjust motors, pulleys, belts, sprockets, chains, and controls according to manufacturer's written instructions.

E. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 08 36 13

SECTION 08 4113 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes aluminum entrances and storefronts. The aluminum entrance and storefront work includes the following:
   1. Aluminum storefront framing.
   2. Aluminum swing entrance doors and framing, including hardware, stripping and thresholds.
   3. Aluminum trim, flashings, and similar items in conjunction with aluminum entrance and storefronts.
   4. Painting and coating in conjunction with the above aluminum items.
   5. Internal steel and aluminum reinforcements for aluminum entrances and storefronts.
   6. Internal and perimeter sealing, joint fillers, weeps, vents and gasketing systems for aluminum entrances and storefronts.
   7. Anchors, shims, fasteners, inserts, expansion devices, accessories, support brackets and attachments for aluminum entrances and storefronts.
   8. Glass and glazing for aluminum entrances and storefronts.
   9. Security system components may be incorporated into the door and frame openings of all aluminum entrance and storefront work at the Owner's option. Cooperate with the Owner's security system contractors if the Owner chooses to incorporate security system components during the course of the Work.

B. Related Work:
   1. Division 08 Section ‘Automatic Door Operators’ for electronic door operators and Accessible Entry doors.
   2. Division 08 Section ‘Door Hardware’ for door hardware specified for exterior and interior doors.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum entrance and storefront systems meeting or exceeding the following performance requirements:
   1. Structural Properties:
      a. Wind Loads: The aluminum entrance and storefront work, including glass, shall be designed, fabricated and installed to withstand the maximum inward and outward wind pressures indicated below or local code whichever is greater:
         1) Field of Wall: 25 psf.
         2) Corners: 30 psf.
            a) Corners are defined as areas within 15’-0" of building corners. Where this dimension falls within a glass panel, the entire panel, including its support framing, is to be designed according to the requirements for corner areas.

b. Deflection Limitations:
   1) Deflections: Base calculations for the following deflections upon the combination of maximum direct wind loads, building deflections, thermal stresses, and erection tolerances.
      a) The deflection of any framing member in a direction normal (perpendicular) to the plane of the wall when subjected to the full code required wind loads specified above shall not exceed 1/175 of its clear span or 3/4 inch whichever is less, except limit deflection of glass to 1 inch.
      b) Glass, sealants and interior finishes shall not be included to contribute to framing member strength, stiffness or lateral stability.
   2) Do not permit any permanent deformation (set) in the metal framing work. Permanent deformation, fastener, weld, or gasket failure, component breakage or disengagement shall not occur under wind loading equal to 1.5 times the wind loads (positive or negative). Permanent deformation shall be taken as deflection without recovery exceeding 1/1000 times span.

c. Dead Loads:
   1) Maximum full deadload deflections, parallel (in-plane) to wall plane, of framing members shall not reduce glass bite or glass coverage, to less than 75% of the design dimension, and shall not reduce edge clearance to less than 25% of design dimension or 1/8 inch whichever is greater.
   2) Limit deflections of metal members spanning door openings to 1/300. The clearance between the member and an operable door shall be no less than 1/16 inch.
   3) Twisting (rotation) of the horizontals due to the weight of the glass shall not exceed 1 degree, measured between ends and center of each span.

d. Uniform Structural Loads: Satisfactory uniform wind loading tests of each aluminum entrance and storefront assembly (each swinging and sliding door) shall have been conducted in accordance with the requirements of ASTM E330. Each assembly shall have been subjected to inward and outward acting uniform loads equal to 1.5 times the inward and outward acting design wind loads specified above under paragraph 'wind loads'. Satisfactory performance at these loads shall mean no glass or other component breakage, component disengagement, and no permanent deformation of main framing members in excess of the permanent deformation criteria specified above.

e. Operational (Traffic) Loads: Design and fabricate aluminum entrances to withstand the operating loads which result from heavy traffic conditions using the specified hardware, without measurable permanent deflection. Limit elastic deflections so as to provide the normal degree of rigidity required to avoid glass breakage, air leaks and other objectionable results of excessive flexibility. Provide weatherstripping at stiles, sill and head rails of door leaves, to minimize air, water and sound leaks.

B. Air Leakage: Air leakage through each aluminum entrance and storefront assembly shall not have exceeded 0.06 cfm/sq. ft. of fixed wall area when tested in accordance with ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft.

C. Water Penetration:
   1. Water penetration in this specification is defined as the appearance of uncontrolled water, other than condensation, on any indoor face of any part of the wall.

2. Provision shall be made to drain to the exterior face of the wall any water entering the system.
3. No uncontrolled water penetration shall have occurred when each entrance and storefront assembly (each entrance and storefront wall) was tested in accordance with the ASTM E331 for one 15 minute cycle at a static pressure difference of 12 lbf/sq. ft. minimum.

D. Thermal Movements: Fabricate the entrance and storefront work to accommodate for such expansion and contraction of component materials, and supporting elements, as will be caused by surface temperatures ranging from -5 to +180 deg F, without causing buckling, glass breakage, failure of joint sealants, undue stress on metal members and fasteners, failure of doors or other operating units to function properly, reduction of performance, and other detrimental effects.
1. Dimensions shown on Drawings are based on an assumed design temperature of +70 deg F. Fabrication and erection procedures shall take into account the ambient temperature range at the time of the respective operations.

E. Building Frame Movement: Design, fabricate and install aluminum entrances and storefronts to withstand building movements including thermal movements, loading deflections, shrinkage, creep and similar movements. Thermal movements shall be as specified above. Building frame deflections, shrinkage, creep and other movements are available from the structural engineer.

F. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.1.

G. Average Thermal Conductance: Provide storefront systems with average U-values of not more than 0.63 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.1.

H. Glass Statistical Factor: Glass thicknesses when shown on the drawings, or specified, are for convenience of detailing only and are to be confirmed by the Contractor and/or glass manufacturer. All glass for the size openings shown will be provided in thicknesses such that the probability of breakage at the design "Wind Load" will not exceed 8 lights per 1000 lights (S.F. 2.5) based on a 60 second uniform wind load duration, and reflectance and shading indicated. The glass manufacturer shall provide, on request, substantiating glass breakage data if such data is not otherwise available as manufacturer's published data.

I. Design Modifications:
1. Submit design modifications necessary to meet the performance requirements and field coordination.
2. Variations in details or materials shall not adversely affect the appearance, durability or strength of components.
3. Maintain the general design concept without altering size of members, profiles and alignment.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each aluminum entrance and storefront product specified.

B. Shop Drawings: Submit shop drawings showing scaled elevations, plans, and sections of the aluminum entrance and storefront work. Full-scale sections shall be prepared and submitted

for details of the assemblies that cannot be shown in the elevations or sections. Include with shop drawings metal thickness of all metal components, glass thicknesses, metal finishes, and all other pertinent information as necessary or requested by the Architect to indicate compliance with the Contract Documents. Details of field connections, anchorage, and their relationship to the work of others shall be clearly indicated for the coordination of the work by other building trades. Details of fastening and sealing methods and product joinery shall be shown to ensure proper performance of the field installation. No work shall be fabricated until shop drawings for that work have been approved by Architect for fabrication.

C. Samples: Submit samples of the following before any work is fabricated:
   1. 3 paired sets of samples for each exposed metal finish required. Sample finishes shall be on the specified alloy, temper, and thickness of metal required for the work. Where finishes involve color and texture variations, include sample sets showing the full range of variations expected. Furnish samples in either 12-inch- lengths of patch fittings, rails, or 12-inch- squares of sheet.

D. Structural Calculations: Submit, for information only, copies of structural calculations indicating complete compliance with the specified performance requirements. Calculations shall be prepared, signed and sealed by a Structural Engineer registered in the state wherein the work is to be erected.

E. Field Test Reports: Submit field testing reports.

F. Product Test Reports: Submit certified product test reports based on tests performed by an AAMA Accredited Laboratory clearly describing in written form, and in shop drawing form, compliance of each aluminum entrance and storefront assembly (each swinging and sliding door) with requirements indicated based on comprehensive testing.

G. Maintenance Instructions: Submit copies of manufacturer's written instructions for adjustment, operation and maintenance of doors.

H. Pre-construction Sealant Compatibility and Adhesion Testing: Submit test results.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Award the fabrication of aluminum entrance and storefront door and frame components to a single firm specializing in the fabrication of aluminum entrance and storefront components who has successfully produced work similar in design and extent to that required for the project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 5 years. The fabricator shall have sufficient production capacity, have organized quality control and testing procedures, and published written and illustrated installation manuals, to produce and properly install the entrance assemblies required without causing delay in progress of the Work.

B. Installer Qualifications: Subcontract the aluminum entrance and storefront work to a firm which is specialized in the erection of entrances and storefronts and who has successfully installed work similar in design and extent to that required for the project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 10 years.

C. Testing laboratories shall be specifically qualified to conduct laboratory and field performance tests required by these specifications and acceptable to the Architect.

D. Pre-construction Sealant Compatibility and Adhesion Testing: Test results confirming compatibility and adhesion are mandatory for all concealed and exposed sealant materials in contact with exterior glazing, other sealants, flashings, metal framing, and shims prior to full size sample installation construction. Refer to Division 07 Section "Joint Sealants" for specific testing requirements, and anticipated lead time necessary to perform testing.

E. Standards: Comply with the applicable provisions and recommendations of the following standards below, where standards conflict the more stringent shall apply:
   1. Aluminum Association (AA):
      a. No. 1 "Aluminum Standards and Data."
      b. "The Aluminum Design Manual."
   2. American Architectural Manufacturers Association (AAMA):
      a. AAMA "Aluminum Curtain Wall Design Guide Manual," Volumes 1-9.
      b. AAMA "Aluminum Store Front and Entrance Design Guide Manual."
      c. AAMA 611 "Anodized Architectural Aluminum."
      d. AAMA 2603 "Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum."
      e. AAMA 2605 "Specification for Superior Performing Organic Coatings on Architectural Extrusions and Panels".
   3. American Institute of Steel Construction (AISC), "Steel Construction Manual," Current Edition.
   4. Steel Structures Painting Council (SSPC): "Steel Structures Painting Manual, Vol. 2, Systems and Specifications."
   5. Federal Standard 16 CFR 1201, Consumer Product Safety Commission (CPSC): "Safety Standard for Architectural Glazing Materials," as published in the Code of Federal Regulations (CFR). Comply with the applicable requirements of the laws, codes, ordinances and regulations of Federal and Municipal authorities having jurisdiction, wherever requirements conflict the more stringent shall be required. Obtain approvals from all such authorities. As a minimum provide safety glazing complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
   6. Welding Standards: Welding shall be performed by skilled and qualified mechanics. Welding shall be performed in accordance with the applicable provisions of AWS D1.1 "Structural Welding Code - Steel" and AWS D1.2, "Structural Welding Code--Aluminum."

F. Sample Installations:
   1. General: Sample installations will be used as a standard for judging acceptability of work for the Project. Replace unsatisfactory work as directed. Maintain sample installations during construction as a standard for judging acceptability of the exterior wall work. Properly finished, maintained, and performing sample installations shall be retained as a portion of the completed work.
   2. Size: Provide full sized sample installations to the extent indicated on the drawings, or if not indicated, as directed by the Architect. Sample installations shall be built on site complete with all glass, aluminum framing, adjacent cladding materials, anchors, connections, flashings, sealants, and joint fillers as accepted on the final shop drawings. Do not take special precautions or use techniques that do not represent those to be used on the work. Do not enclose the interior side of the wall with interior finishes and insulation materials.

3. Approval of sample installations does not constitute approval of deviations from the Contract Documents contained in sample installations unless Architect specifically approves such deviations in writing.
4. Approved sample installations may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Prior to the start of the aluminum entrance and storefront work, and at the Contractor's direction, meet at the site and review the installation procedures and coordination with other work. Meeting shall include Contractor, Owner, aluminum entrance and storefront installer, sealant installer, as well as any other subcontractors or material technical service representatives whose work, or products, must be coordinated with the aluminum entrance and storefront work.

1.5 IDENTIFICATION, DELIVERY, STORAGE, AND HANDLING

A. General: Comply with the applicable provisions of AAMA "Curtain Wall Manual #10" for the care and handling of aluminum entrance and storefront work from shop to site.

B. All components of the aluminum entrance and storefront work shall be identified after fabrication by marks clearly indicating their location in the building. Packaging of components shall be so selected to protect the components from damage during shipping and handling.

C. Storage on Site:
1. Store aluminum entrance and storefront components in a location and in a manner to avoid damage to the components. Stacking shall be done in a way which will prevent bending, excessive pressure, abrasion or other permanent damage of the component and its finished surfaces.
2. Store aluminum entrance and storefront components and materials in a clean, dry location, away from uncured concrete, masonry work, sprayed on fireproofing work, and other construction activities. Cover with non-staining waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.

D. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of metals.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of supporting structure by field measurements before fabrication so that the entrance and storefront work will be accurately designed, fabricated and fitted to the structure. Indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Use Contractor's lines and benchmarks as a basis for measurements.

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and

shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a 2 year written warranty, beginning from date of substantial completion, and executed by the Contractor, manufacturer and the aluminum entrance and storefront installer agreeing to repair or replace components of entrance and storefront systems that develop defects in materials or workmanship within the specified warranty period. Defects include, structural failures, sealant failures, deterioration of metals, metal finishes, and other materials beyond normal weathering, failure of operating components to function properly, uncontrolled water leakage, uncontrolled air leakage, and any other evidence of failure or deterioration of the aluminum entrance and storefront work to meet performance requirements.

C. Warranty; Anodized Coatings: Submit a warranty for a period of 3 years, warranting that the anodized aluminum will not develop excessive fading or excessive non-uniformity of color or shade, and will not crack, peel, pit, or corrode; all within the limits defined as follows:
1. "Excessive Fading" means a change in appearance which is perceptible and objectionable as determined by the Architect when viewed visually in comparison with the original color range samples.
2. "Excessive Non-Uniformity" means non-uniform fading during the period of the warranty to the extent that adjacent panels have a color difference greater than the original acceptable range of color.
3. "Will Not Pit or Otherwise Corrode" means there shall be no pitting or other type of corrosion discernable from a distance of 10 feet, resulting from the natural elements in the atmosphere at the project site.

PART 2 - PRODUCTS

1.8 MANUFACTURERS

A. Basis-of-Design Products:
1. Aluminum Storefront: Subject to compliance with requirements, provide the Trifab 451 system by Kawneer North America; an Alcoa company, or a comparable system, subject to review and approval of Architect, by one of the following:
   a. Tubelite.
   b. United States Aluminum.
   c. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
   d. YKK AP America Inc.
2. Aluminum Entrances: Subject to compliance with requirements, provide the Series 350 Heavy Wall entrance doors by Kawneer North America; an Alcoa company, or a comparable system, subject to review and approval of Architect, by one of the following:
   a. Tubelite.
   b. United States Aluminum.
   c. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
   d. YKK AP America Inc.

1.9 MATERIALS

A. Aluminum: Conform to the requirements published in AA "Aluminum Standards and Data," referenced ASTM standards and the following. All aluminum extrusions shall be manufactured to dimensional tolerances so as to eliminate any edge projection or misalignment at joints. Unless otherwise specified, provide alloy and temper as required to suit performance requirements and finish(es) indicated. Provide concealed extruded bars, rods, shapes and tubes in alloys as recommended by the fabricator to join or reinforce assembly of exposed aluminum components.
   1. Alloys:
      a. Sheet and Plate: Alloy 5005 and ASTM B 209, 'Anodizing Quality'.
      b. Extruded Bars, Rods, Shapes, and Tubes: Alloy 6063 and ASTM B 221, 'Anodizing Quality'.
      c. Bars, Rods, and Wire: ASTM B 211.
   2. Welding Rods and Bare Electrodes: AWS A5.10.

B. Carbon Steel: For carbon steel components required to join, reinforce or support the assembly of aluminum components provide carbon steel conforming to ASTM A 36/A 36M for structural shapes, plates, and bars; ASTM A 1008/A 1008M for cold-rolled sheet and strip; or ASTM A 1011/A 1011M for hot-rolled sheet and strip.

C. Glass and Glazing Materials: As specified in Division 08 Section "Glazing."

D. Anchors and Fasteners:
   1. Material: Stainless steel.
   2. Anchor and Fastener Metal Alloy Types, Designations and Standards: Alloys as selected by fabricator to prevent corrosion resistance with the components fastened. Do not use self-drilling, self-tapping type fasteners.
   3. Do not use exposed anchors and fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.
   4. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.

E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

F. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, complying with ASTM A 666, Type 304.

G. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:
   1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.
   2. Sliding Weather Stripping: Wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing complying with AAMA 701 requirements.

H. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout; complying with ASTM C 1107; of consistency suitable for application.

2.3 DOOR HARDWARE

A. Door Hardware: At each hinged single door provide:

1	EA	CONTINUOUS HINGES	Manufacturer's Standard	689	
1	SET	PUSH PULL BARS	Manufacturer's Standard Architect's Classic	689	
1	EA	DEADBOLT W/ THUMBTURN	Manufacturer's Standard 1850	626	ADR
1	EA	SURFACE CLOSER	4041 HCUSH	689	LCN
1	EA	OVERHEAD STOP	100 Series	630	GLJ
1	EA	THRESHOLD	Manufacturer's Standard 1/2" H	AL	
1	SET	DOOR GASKETING	S88	BL	PEM
2	EA	DOOR SWEEP	420CSL	AL	PEM

B. Door Hardware: At each hinged single ADA door provide:

1	EA	CONTINUOUS HINGES	Manufacturer's Standard	689	
1	SET	PUSH PULL BARS	Manufacturer's Standard Architect's Classic	689	
1	EA	DEADBOLT W/ THUMBTURN	Manufacturer's Standard 1850	626	ADR
1	EA	SURFACE CLOSER	4041 HCUSH	689	LCN
1	EA	OVERHEAD STOP	100 Series	630	GLJ
1	EA	THRESHOLD	Manufacturer's Standard 1/2" H	AL	
1	SET	SEALS	S88	BL	PEM
1	EA	DOOR SWEEP	420CSL	AL	PEM
1	EA	DOOR OPERATOR	Refer to Specification Section 81 7113		

C. Door Hardware: At each hinged single door provide:

1	EA	CONTINUOUS HINGES	Manufacturer's Standard	689	
1	EA	OFFICE LOCK	Manufacturer' Standard	630	ADR
1	EA	SURFACE CLOSER	4041 HCUSH	689	LCN
1	EA	OVERHEAD STOP	100 Series	630	GLJ
1	EA	THRESHOLD	Manufacturer's Standard 1/2" H	AL	
1	SET	DOOR GASKETING	S88	BL	PEM
1	EA	DOOR SWEEP	420CSL	AL	PEM

D. Door Hardware: At each hinged double door provide:

2	EA	CONTINUOUS HINGES	Manufacturer's Standard	689	
2	SET	PUSH PULL BARS	Manufacturer's Standard Architect's Classic	689	
1	EA	DEADBOLT W/ THUMBTURN	Manufacturer's Standard 1850	626	ADR
2	EA	SURFACE CLOSER	4041 HCUSH	689	LCN
2	EA	OVERHEAD STOP	100 Series	630	GLJ
2	EA	FLUSH BOLTS	FB458	626	IVE
2	EA	DUSTPROOF STRIKE	DP2	626	IVE
1	EA	THRESHOLD	Manufacturer's Standard 1/2" H	AL	
2	SET	SEALS	S88	BL	PEM
2	EA	DOOR SWEEP	420CSL	AL	PEM

E. Door Hardware: At each hinged+bifold 3 panel door provide:

3	EA	CONTINUOUS HINGES	Manufacturer's Standard	689	
1	SET	PUSH/PULL BARS	Manufacturer's Standard Architect's Classic	689	
1	EA	DEADBOLT W/ THUMBTURN	Manufacturer's Standard 1850	626	ADR
1	EA	SURFACE CLOSER	4041 HCUSH	689	LCN
1	EA	OVERHEAD STOP	90H	630	GLY
4	EA	FLUSH BOLTS	FB458	626	IVE
2	EA	DUSTPROOF STRIKE	DP2	626	IVE
1	EA	THRESHOLD	Manufacturer's Standard 1/2" H	AL	
3	SET	SEALS	S88	BL	PEM
3	EA	DOOR SWEEP	315CN	AL	PEM
1	EA	RISER BLOCK	Manufacturer's Standard		

1.10 SEALING MATERIALS

A. Concealed Sealing Materials: All sealing materials concealed within the entrances and storefronts shall be silicone, compatible with and adherent to each material it will be in contact with, as recommended by the manufacturer to fulfill performance requirements.

B. Exposed Sealing Materials: All sealing materials exposed at entrance and storefront perimeter joints in contact with adjacent cladding materials: Silicone, refer to Division 07 Section "Joint Sealants."

1.11 FABRICATION

A. General: Fabricate the entrances and storefronts to the designs, shapes, and sizes shown using the materials specified and shown to produce assemblies that meet or exceed the performance requirements. To the greatest extent possible complete fabrication, assembly, finishing, hardware applications and other work before shipment to Project site.
   1. Metal Wall Thickness: Provide shapes as shown and as required to suit the performance requirements but with wall thickness of not less than 3/16 inch.
   2. Door Stile and Rail Dimensions:
      a. Bottomrails: Provide minimum 6-1/2-inches high one piece bottomrail unless otherwise indicated on the drawings.
      b. Stiles and Top Rail Dimensions: Medium stile; 3-1/2-inch nominal width.
      c. Door Thickness: 2-inches.
      d. Preglaze door units to greatest extent possible, in coordination with installation and hardware requirements. Glazing, whether in factory or in field, shall be performed in accordance with Division 08 Section "Glazing."
      e. Fabricate all doors and frames to accommodate the swing direction shown.
   3. Provide extruded aluminum entrance door inserts at door frames designed with bosses sized to receive selected door gasket.

B. Provide continuous interior glazing stops with concealed fasteners for all doors and frames. Provide stops with hairline joints at corners. Provide stops with square, not beveled, shouldered profile unless otherwise shown.

C. Doors and frames shall be cut, reinforced, drilled and tapped in strict accordance with the printed door hardware manufacturer's templates and instructions. Provide solid stainless steel

or bronze hardware reinforcements, securely fastened to doors and frames where door hardware is to be attached.

1. Security and ADA system components may be incorporated into the door and frame openings of all entrance doors and frames. Provide all cutouts required by the Owner's security system vendor and the ADA hardware supplie and all prewiring for vendor provided security and ADA system devices. Wherever storefront and entrance framing components are to receive wiring provide unobstructed clear paths free of burrs and sharp objects with pull strings to facilitate wiring.

D. Joints in Metal Work: All exposed work shall be carefully fitted and matched to produce continuity of line and design, with all joints, being accurately fitted for hairline contact and rigidly secured. Where additional rigidity or strength is required to satisfy the performance requirements reinforce entrance components with aluminum or carbon steel shapes, bars, and plates.

E. Shop Assembly: As far as practicable, all fitting and assembly work shall be done in a fabrication shop.

1. For exterior entrances, provide weepholes and internal water passages in the glazing framing recesses as recommended by the respective glass and framing manufacturers to conduct infiltrating water to the exterior. Provide weep baffles secured to inside of frame behind weepholes.

F. Exposed Fasteners: Not permitted.

G. Protection of Metals: Wherever dissimilar metals are in contact, except in the case of aluminum in contact with galvanized steel, zinc, separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires. Wherever aluminum comes in contact with concrete surfaces separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires.

1.12 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Finish Application:

1. Apply anodized coatings to all exposed surfaces of storefront and entrance components.

C. Appearance of Finished Work: During production, maintain large size color range samples for use in comparing against production material. Variations in appearance of abutting or adjacent pieces are acceptable if they are within the range of approved samples. Noticeable variations in the same piece are not acceptable.

D. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

E. Class I, Clear Anodic Finish: Complying with AA-M10C22A41 for an Architectural Class I finish and the following:

1. Metal Preparation and Pretreatment: Remove die markings prior to finishing operations. Perform this work in addition to the finish specified. Scratches, abrasions, dents and similar defects are unacceptable.
2. Thickness: Minimum 0.7 mil, weighing not less than 27.0 mg per sq. in., minimum apparent density of 38 g per cubic in.
3. Performance Criteria: Meets or exceeding AAMA 611.
4. Color: Medium matte finished, clear natural anodized.
5. Post Anodizing Finish (Sealing): Anodized finishes shall be fully sealed by the manufacturer or processor according to procedures recommended by the licensor of the process. Maximum weight loss shall be 2.6 mg/ sq. in.

1.13 COATINGS FOR CONCEALED METAL SURFACES

A. General: The following protective coatings shall be applied to surfaces of metals which are to be concealed in the construction:

1. Coating for Carbon Steel: Hot dip galvanized, complying with ASTM A123.
2. Coating for Aluminum and Carbon Steel: Where aluminum or carbon steel surfaces are to be in contact with each other or in contact with dissimilar materials such as masonry or concrete, and where hot dip galvanizing of carbon steel is incompatible with component parts because of galvanic action or component fabrication tolerances provide one of the following:
   a. Bituminous Paint: Cold-applied, non-sagging, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos. Apply in two coats for an overall minimum dry film thickness of 25 mils.
   b. Zinc Rich Primer: Organic zinc-rich primer, complying with SSPC-Paint 20.

1.14 FRAMING SYSTEMS

A. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

1.15 GLAZING SYSTEMS

A. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
1. Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.
   a. Product: As specified in Division 07 Section "Joint Sealants."
2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
   a. Product: As specified in Division 07 Section "Joint Sealants."

1.16 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

PART 3 - EXECUTION

1.17 PREPARATION

A. Coordinate entrance and storefront work with the work of other Sections and provide items to be placed during the installation of other work at the proper time to avoid delays in the work.

B. Templates and Diagrams: Furnish templates, diagrams, and other data to fabricators and installers of related work, as necessary for coordinating entrance and storefront installation.

C. Place such items, including concealed overhead framing, accurately in relation to the final location of entrance and storefront components.

1.18 EXAMINATION

A. Examine the substrates, adjoining construction, and conditions under which the Work is to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Before beginning installation of the entrance and storefront work examine all parts of the existing building structural frame and the existing building cladding indicated to support the entrance and storefront work. Ensure that the existing swing door thresholds, existing swing doors, swing door framing and subframes have been completely removed with all projecting anchors cut off flush. Notify Contractor in writing, of any dimensions, or conditions, found which will prevent the proper execution of the entrance and storefront work, including specified tolerances. Use Contractor's offset lines and bench marks as basis of measurements.

1.19 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight. Clean excess joint sealants from finished surfaces.
   1. Cut and trim component parts of the entrance and storefront work during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely to protect material and remove all evidence of cutting and trimming. Remove and replace members where cutting and trimming has impaired strength or appearance, as directed by Architect.
   2. Set components within the erection tolerances with uniform joints. Place components on shims and fasten to supporting substrates using bolts and similar fasteners. Use stainless steel shims at structural connections only. U shaped shims at structural connections are not permitted. Use aluminum, stainless steel, or high impact polystyrene shims at other connections.

3. Do not erect components that are warped, deformed, bowed, dented, defaced or otherwise damaged as to impair its strength or appearance. Remove and replace members damaged in the process of erection.
4. Coat concealed surfaces of dissimilar materials, and any ferrous metal components, with a heavy coating of bituminous paint, zinc rich primer or other separation in accordance with manufacturer's recommendations. Where aluminum components will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
5. No holes or slots shall be burned, cut into, or field drilled in any building framing member without the written acceptance of the structural engineer.

B. Entrance and Storefront Framing: Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.

C. Entrance Doors: Doors shall be securely anchored in place to a straight, plumb and level condition, without distortion. Adjust doors to provide a tight fit at contact points for weathertight closure and to operate smoothly, without binding, with hardware functioning properly. Weatherstripping contact, and hardware movement, shall be field tested and final adjustment, and lubrication, made for proper operation and performance of doors.

D. Install glazing to comply with requirements of Division 08 Section "Glazing," unless otherwise indicated.
1. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

E. Install perimeter sealant to comply with requirements of Division 07 Section "Joint Sealants," unless otherwise indicated.

F. Install weatherseal sealant according to Division 07 Section "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

G. Concealed Sealing Components: Apply sealant and gasket components that are integral to the entrance and storefront systems in strict accordance with the each component manufacturer's printed instructions. Before applying components remove all mortar, dust, dirt, moisture, and other foreign matter that will be deleterious to the intended performance of the component. Mask adjoining exposed surfaces to avoid spilling, dripping, dropping or other unintended contact of the sealing components onto adjacent exposed surfaces.

H. Install perimeter fire-containment systems (safing insulation) as specified in Division 07 Section "Fire-Resistive Joint Systems."

1.20 ERECTION TOLERANCES

A. The entrance and storefront systems shall be fabricated and erected to accommodate the dimensional tolerances of the structural frame and surrounding cladding while providing the following as installed tolerances.
1. Variation from theoretical calculated position as located in plan or elevation in relation to established floors lines, column lines and other fixed elements of the structure, including

variations from plumb, level, straight and member size: +/- 1/4 inch max in any 20'-0" run, column-to-column bay, or floor-to-floor height.

2. Alignment: Where surfaces abut in line, and where they meet at corners, limit offset from true alignment to 1/32 inch.
3. Variation from angle, or plumb, shown: +/- 1/8 inch max in any 10'-0" run or story height, non-cumulative.
4. Variation from slope, or level, shown: +/- 1/8 inch max in any 20'-0" run or column-to-column bay, non-cumulative.

1.21 ANCHORAGE

A. Anchorage of the entrance and storefront work to the structure and surrounding cladding shall be in accordance with the accepted shop drawings.

1.22 WELDING

A. Weld with electrodes and by methods recommended by manufacturer of material being welded, and in accordance with AWS D1.1 for concealed steel members.

B. Welds and adjacent metal areas shall be thoroughly cleaned and coated with a single coat of bituminous paint.

1.23 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing agency to perform field quality-control testing indicated. Conduct tests of each specified sample installation under the direction of the testing agency in the presence of the Owner, Architect, the Contractor, various component manufacturers and fabricators and the Installer for each system incorporated in the sample installation.

B. Water Spray Without Air Pressure Difference Test: After completing the installation of test areas indicated, but before the installation of interior finishes has begun, test storefront system for water penetration according to AAMA 501.2 requirements.

C. Repair or remove and replace Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

1.24 REMOVAL OF DEBRIS

A. All debris caused by, or incidental to, the erection of the entrance and storefront work shall be removed from the site and disposed of legally.

1.25 CLEANING

A. Clean metal surfaces promptly after installation, exercising care to avoid damage to factory finished exposed surfaces.

B. Wash glass on both faces not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer. Remove excess glazing and sealant compounds, dirt, and other substances.

C. Immediately remove any deleterious material from surfaces of aluminum.

1.26 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that entrance and storefront work will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 08 4113
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SECTION 08 4413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazed aluminum curtain wall assemblies installed in single-story, strip window ("storefront") applications. The aluminum curtain wall work includes the following:
   1. Aluminum window wall and curtain wall framing.
   2. Aluminum trim, snap in sealant stops, flashings, parapet copings, and similar items in conjunction with aluminum curtain wall assemblies.
   3. Painting and coating in conjunction with the above aluminum items.
   4. Internal steel and aluminum reinforcements.
   5. Internal and perimeter sealing, joint fillers, weeps, vents and gasketing systems.
   6. Anchors, embedments, shims, fasteners, inserts, expansion devices, accessories, support brackets, attachments, and grout.
   7. Glass and glazing for the window walls and curtain walls.

B. This Section includes glazed aluminum (fixed) assemblies installed in punched opening applications. The aluminum fixed window work includes the following:
   1. Aluminum window framing.
   2. Aluminum trim, snap in sealant stops, flashings, and similar items in conjunction with aluminum window assemblies.
   3. Painting and coating in conjunction with the above aluminum items.
   4. Internal and perimeter sealing, joint fillers, weeps, vents and gasketing systems.
   5. Anchors, embedments, shims, fasteners, inserts, accessories, support brackets, attachments.

C. Glass and glazing for the window walls and curtain walls.

D. Related Sections:
   1. Refer to Division 07 Section “Joint Sealants” for sealants incorporated in the curtain wall work.
   2. Refer to Division 08 Section "Aluminum Framed Entrances and Storefronts" for entrance doors and storefront framing, including hardware, stripping and thresholds.
   3. Refer to Division 08 Section "Glazing" for glass and glazing incorporated in the curtain wall system.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide glazed aluminum curtain wall systems meeting or exceeding the following performance requirements:
   1. Structural Properties:
      a. Wind Loads: The glazed aluminum curtain wall work, including glass, shall be designed, fabricated and installed to withstand the maximum inward and outward wind pressures as required by local Code or as noted below whichever is greater:
         1) Field of Wall: 25 psf.

2) Corners and Edges: 30 psf.
   a) Corners and edges are defined as wall areas within 15’-0” of building corner or edge, including tops of walls. If limit of area falls between mullions, the area shall be extended to the next mullion.
   b) Walls at corners and edges shall be designed to resist positive pressure on one side and negative pressure on the other, occurring simultaneously.

b. Deflection Limitations:
   1) Deflections: Base calculations for the following deflections upon the combination of maximum direct wind loads, building deflections, thermal stresses, and erection tolerances.
      a) The deflection of the framing members for each unit of glass in a direction normal to the plane of the wall when subjected to the full code required wind loads indicated above shall not exceed 1/175 of the glass edge length for members spanning up to 13'-6" and 1/240 for spans exceeding 13'-6", or 3/4 inch whichever is less, except limit deflection of glass to 1 inch.
      b) Glass, sealants and interior finishes shall not be included to contribute to framing member strength, stiffness or lateral stability.
      c) Cantilever Deflection: The deflection of a framing member overhanging an anchor point shall be limited to 2L/175 where L is the length of the cantilevered member.
      d) In addition to the above deflections, stone supporting aluminum framing members shall be limited to 1/600 parallel and perpendicular to the wall plane, with rotation of continuous member on kerfed stone limited to a maximum of 1/16 inch.
   2) Do not permit any permanent deformation (set) in the metal framing work. Permanent deformation, fastener, weld, or gasket failure, component breakage or disengagement shall not occur under wind loading equal to 1.5 times the wind loads (positive or negative). Permanent deformation shall be taken as deflection without recovery exceeding 1/1000 times span.

c. Dead Loads:
   1) Maximum full deadload deflections, parallel (in-plane) to wall plane, of framing members shall not reduce glass bite or glass coverage, to less than 75 percent of the design dimension, and shall not reduce edge clearance to less than 25 percent of design dimension or 1/8 inch, whichever is greater.
   2) Limit deflections of metal members spanning door openings to 1/300. The clearance between the member and an operable door shall be no less than 1/16 inch.
   3) Twisting (rotation) of the horizontals due to the weight of the glass shall not exceed 1 degree, measured between ends and center of each span.

d. Uniform Structural Loads: Recent satisfactory uniform wind loading tests, acceptable to the Architect, of each glazed curtain wall assembly (each window, window wall, curtain wall, entrance and storefront) shall have been conducted in accordance with the requirements of ASTM E330. Each assembly shall have been subjected to inward and outward acting uniform loads equal to 1.5 times the inward and outward acting design wind loads specified above under paragraph 'wind loads'. Satisfactory performance at these loads shall mean no glass or other component breakage, component disengagement, and no permanent deformation of main framing members in excess of the permanent deformation criteria specified above.

1) The qualification of 'recent' test results is to limit the glazed curtain wall assemblies being provided for the project to only those which have been tested within the last five (5) years and under conditions similar to the project requirements.
   a) In the absence of satisfactory test results, a full scale laboratory mock up and testing program shall be required and conducted to the extent specified under Article "Quality Assurance", paragraph "Laboratory Mock-Up Testing and Field Testing".

e. Operational (Traffic) Loads: Design and fabricate curtainwall framing at entrances to withstand the operating loads which result from heavy traffic conditions using the specified hardware, without measurable permanent deflection. Limit elastic deflections so as to provide the normal degree of rigidity required to avoid glass breakage, air leaks and other objectionable results of excessive flexibility. Provide weatherstripping at stiles, sill and head rails of door leaves, to minimize air, water and sound leaks.

B. Air Leakage: Air leakage through each glazed aluminum curtain wall assembly shall not have exceeded 0.06 cfm/sq. ft. of fixed wall area when tested in accordance with ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft.

C. Water Penetration:
1. Water penetration in this specification is defined as the appearance of uncontrolled water, other than condensation, on any indoor face of any part of walls exposed on the interior of the building. Water contained within drained flashings, gutters, and sills, and subsequently redirected to the exterior, is not considered water leakage.
2. Provision shall be made to drain to the exterior face of the wall any water entering the system.
3. No uncontrolled water penetration shall have occurred when each glazed aluminum curtain wall assembly was tested in accordance with the ASTM E331 for one 15 minute cycle at a static pressure difference of 12 lbf/sq. ft. minimum.

D. Thermal Movements: Fabricate the glazed aluminum curtain wall work to accommodate for such expansion and contraction of component materials, and supporting elements, as will be caused by surface temperatures ranging from -5 to +180 deg F, without causing noise, buckling, glass breakage, failure of joint sealants, undue stress on metal members and fasteners, failure of doors or other operating units to function properly, reduction of performance, and other detrimental effects.
1. Dimensions shown on Drawings are based on an assumed design temperature of +70 deg F. Fabrication and erection procedures shall take into account the ambient temperature range at the time of the respective operations.

E. Building Frame Movement: Design, fabricate and install glazed aluminum curtain walls to withstand building movements including thermal movements, loading deflections, shrinkage, creep and similar movements without glass breakage, anchor failures, or structural damage. Thermal movements shall be as specified above. Building frame deflections, shrinkage, creep and other movements are available from the structural engineer.

F. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 55 when tested according to AAMA 1503.1.

G. Average Thermal Conductance: Provide glazed aluminum curtain wall systems with average U-values of not more than 0.63 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.1.

H. Perimeter Sealing: All exterior curtain wall systems shall be dual sealed to the adjacent surround conditions.
1. The outermost seal (weatherseal) shall be located in a plane adjacent the water barrier line of the window system. This seal shall be intermittently weeped.
2. The innermost seal (airseal) shall be located such that it can be sealed to the architectural surround system. Sealing this airseal to interior finish conditions such as drywall or rigid insulation is unacceptable.
   a. A cosmetic seal from the frame to the drywall may be required, in addition to the dual seals. This seal shall be assumed to be provided for all “snap cap” type window systems.
3. Hollow tube sections or open ended extrusions which interface with weather and air seals shall be closed or otherwise treated so that sealant has a solid surface to adhere to; with a minimum dimension of 1-inch. Manufacturer’s standard approach to closing off end sections will be acceptable, if reviewed and approved in advance by the Architect.

I. Anchoring of Assemblies:
1. Head Anchorage: Employ a concept, which resists wind loading but allows for thermal expansion/contraction and/or differential movements.
2. Jamb Anchorage: Preference is to eliminate or minimize if possible. If necessary, jamb anchorage methods must be able to accommodate the thermal movement of frame though a method, such as vertically slotted holes, which has been reviewed by the Architect.

J. Connections and Attachments:
1. All connections and attachments shall be detailed so as to only provide resistance to forces and effects considered in their design. Friction between connected material shall be prevented from inducing unanticipated restraint by the use of appropriate friction-inhibiting detailing.
2. Actual tension shall be taken as the sum of direct tension plus tension due to prying.
3. Shims used in connections shall be non-corrosive.
4. Shimmed connections shall be design-engineered such that the shims provide no resistance to fastener bending.
5. Where applicable, combined tension and shear shall be evaluated according to an interaction formula wherein each term equals the square of the actual force, divided by the square of the allowable force. The sum of the terms shall not exceed one (1).
6. Gravity Load Connections: Gravity load connections shall not rely on friction between connected materials induced by bolt tension to transfer gravity loads at vertical slots.
7. Wind or Thermal Connections: Provide with slotted or oversized holes or other approved means of non-restraint. Where sliding friction could cause binding of movement, provide appropriately designed slide plates, such as high durometer plastic, "Korolath", or "Teflon" coated material.
8. Connections shall be concealed (visually) within the curtainwall / window system or within the architectural features of the Project.
9. Connections shall not interrupt flashing systems.
10. Wherever practical, field connections shall be designed to be bolted.
    a. Minimize field welding as much as possible.
    b. Field welds, where unavoidable, shall be designed with insignificant stiffness in all directions except the direction of the design force. (Such that the connections will be ductile rather than induce unanticipated restraint.)

c. No overhead welding will be allowed.

11. Fasteners: System fasteners shall, as a minimum, conform to the requirements of the following:
    a. AISC Steel Construction Manual, for carbon steel bolts and screws.
    b. AISI Stainless Steel Cold Formed Structural Design Manual, for stainless steel bolts and screws.
    c. ICBO Standards for fasteners in drilled holes into concrete or concrete masonry.
    d. Aluminum Association Specifications for Aluminum Structures, for aluminum fasteners.
    e. Local code and governing authorities.
    f. All fasteners within the window systems shall be designed to prevent loosening under all service conditions. "Lockable" fasteners must have a demonstrable and successful history of use.

K. Glass Statistical Factor: Glass thicknesses when shown on the drawings, or specified, are for convenience of detailing only and are to be confirmed by the Contractor and/or glass manufacturer. All glass for the size openings shown will be provided in thicknesses such that the probability of breakage at the design "Wind Load" will not exceed 8 lights per 1000 lights (S.F. 2.5) based on a 3 second gust wind load duration, and reflectance and shading indicated. The glass manufacturer shall provide, on request, substantiating glass breakage data if such data is not otherwise available as manufacturer's published data.
1. The minimum glass thickness permitted shall be 6.0 mm.
2. All exterior glass shall be assumed to be non-vented due to the use of interior sun screening devices such as shades and horizontal venetian blinds.

L. Design Modifications:
1. Submit design modifications necessary to meet the performance requirements and field coordination.
2. Variations in details or materials shall not adversely affect the appearance, durability or strength of components, nor shall such variations cause excessive stress, or deflections, to the building structural frame.
3. Maintain the general design concept without altering size of members, profiles and alignment.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each glazed aluminum curtain wall component specified.

B. Shop Drawings: Submit shop drawings showing scaled elevations, plans, and sections of the glazed aluminum curtain wall work. Full scale sections shall be prepared and submitted for details of the assemblies that cannot be shown in the elevations or sections. Include with shop drawings metal thickness of all metal components, glass thicknesses, metal finishes, and all other pertinent information as necessary or requested by the Architect to indicate compliance with the Contract Documents. Details of field connections, anchorage, and their relationship to the work of others shall be clearly indicated for the coordination of the work by other building trades. Details of fastening and sealing methods and product joinery shall be shown to ensure proper performance of the field installation. No work shall be fabricated until shop drawings for that work have been approved by Architect for fabrication.

C. Samples: Submit samples of the following before any work is fabricated:
   1. 3 paired sets of samples for each exposed metal finish required. Sample finishes shall be on the specified alloy, temper, and thickness of metal required for the work. Where finishes involve color and texture variations, include sample sets showing the full range of variations expected. Furnish samples in either 12-inch- lengths of rails, or 12-inch-squares of sheet.

D. Structural Calculations: Submit, for information only, copies of structural calculations indicating complete compliance with the specified performance requirements. Calculations shall be prepared, signed and sealed by a Structural Engineer licensed in the state of California.

E. Field Test Reports: Submit field testing reports.

F. Product Test Reports: Submit RECENT certified product test reports based on tests performed by an AAMA Accredited Laboratory clearly describing in written form, and in shop drawing form, compliance of each glazed aluminum curtain wall assembly with requirements indicated based on comprehensive testing.

G. Maintenance Instructions: Submit copies of manufacturer's written instructions for adjustment, operation and maintenance of swinging and sliding doors.

H. Pre-construction Sealant Compatibility and Adhesion Testing: Submit test results.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Award the fabrication of glazed aluminum curtain wall components to a single firm specializing in the fabrication of glazed aluminum curtain wall components who has successfully produced work similar in design and extent to that required for the project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 5 years. The fabricator shall have sufficient production capacity, have organized quality control and testing procedures, and published written and illustrated installation manuals, to produce and properly install the entrance assemblies required without causing delay in progress of the Work.

B. Installer Qualifications: Subcontract the glazed aluminum curtain wall work to a firm which is specialized in the erection of curtain walls and who has successfully installed work similar in design and extent to that required for the project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 10 years.

C. Laboratory Mock-Up Testing and Field Testing: If recent wind load testing for the curtain wall system cannot be provided by the manufacturer, the following testing shall be performed:
   1. Laboratory Mock-Up Testing: Provide mock-ups to the extent indicated on the drawings and as specified for testing. All required mock-up submittals shall have been reviewed and received final approval from the Architect prior to construction of the mock-ups.
      a. General: Laboratory testing mock-ups will be used as a standard for judging visual and performance acceptability of the work for the project. Replace unsatisfactory work as directed. Provide personnel to construct exterior wall mock-ups who will be the same personnel who will be performing and supervising the actual work.

Simulate actual construction conditions as accurately as possible in every way. Provide extra materials as may be required to replace any which fail during tests. Glass used in the mock-ups shall be cut to the minimum tolerances expected in the final exterior wall installation.

b. Size: As shown but not less than the requirements of AAMA Standard 501 and ASTM E331. Provide a larger mock-up(s) if the proposed exterior wall details create a condition requiring a larger mock-up(s) for proper evaluation and testing. Mock-ups shall be provided at the exterior wall testing facility complete with all glass, aluminum framing, metal panels, stone cladding, anchors, connections, flashings, sealants, and joint fillers as accepted on the mock-up shop drawings. Do not take special precautions or use techniques that do not represent those to be used on the Work.
   1) Refer to the following sections for related materials and requirements for their incorporation into the mock-up(s):
      a) Division 05 Section "Cold-Formed Metal Framing."
      b) Division 07 Section "Sheet Metal Flashing and Trim."
      c) Division 07 Section "Joint Sealants."
      d) Division 08 Section "Glazing."

c. Laboratory Testing: Notify the Architect of the readiness of the mock-ups for preliminary and final testing. Do not begin the testing program without the presence of the Owner's representative and the Architect.
   1) Preliminary Test: Conduct a single static pressure test at 50 percent of the maximum Wind Pressure followed by a single test for water penetration at 50 percent of the pressure hereinafter specified under "Final Tests."
      a) The preliminary test is purposely limited to a single event. No interim or repeat preliminary testing for Contractor benefit or correction of systems shall be permitted.
   2) Make the following tests of the mock-up(s) in accordance with the cited standards except as hereinafter modified, in the order listed, and in accordance with the specified performance criteria. Tests 1 and 5 shall be conducted at 6.24 lbf/sq. ft.. Tests 2, 3, and 6 shall be conducted at 12 lbf/sq. ft. for 1 cycle, maintaining the test pressure for 15 minutes.
      a) Test 1 (For Air Infiltration): ASTM E283. Extraneous air leakage (tare) shall be limited to 10 percent or less of the net air leakage through the exterior wall assembly as provided under ASTM E283. Provide pressure taps as required within the test chamber to ensure uniform stratification of design test pressure across the exterior wall assembly.
      b) Test 2 (For Water Penetration – Uniform Static Pressure): ASTM E331.
      c) Test 3 (For Water Penetration – Dynamic Pressure): AAMA 501.1.
      d) Test 4 (For Structural Performance): ASTM E330, Method B, test to 0.5, and 1.0 times the wind pressure, during test. Deflection readings shall be taken at end connections and midspans of main framing members, at intersections of framing members and at midspans of glass holding members, glass and panels. Readings shall be taken for both positive and negative loading. If failure occurs through glass breakage prior to achieving 1.5 times the maximum wind pressure, replace glass and repeat test. Two successive failures of the same light or panel not otherwise attributable to inherent glass defects will be considered unacceptable. Further tests shall be suspended until

deficiencies are corrected, which may include increasing the stiffness of glass holding members and/or adjustment of the glazing details.

e) Test 5 (Retest for Air Infiltration): ASTM E283. Extraneous air leakage (tare) shall be limited to 10 percent or less of the net air leakage through the exterior wall assembly as provided under ASTM E283. Provide pressure taps as required within the test chamber to ensure uniform stratification of design test pressure across the exterior wall assembly.

f) Test 6 (Retest for Water Penetration – Uniform Static Pressure): ASTM E331.

g) Test 7 (For Structural Performance): ASTM E330, Method B, except conduct test to 1.5 times the maximum wind pressure. Record pressures and deflections at 1.5 times the wind pressure, during test.

h) Test 9 (Exterior Window Maintenance Equipment Test): Perform concentrated load testing on the exterior wall maintenance tie back equipment attached to the exterior wall framing. Apply outward, inward, and side-loading of a magnitude and for a duration as required to comply with the authorities having jurisdiction for window washing equipment. There shall be no failure or gross permanent distortion of the tie back equipment or any part of the exterior wall framing.

i) Test 10 (For Thermal Transmittance and Condensation Resistance): At the completion of Test 9, carefully disassemble the glass, glazing, and metal framing components and reassemble them as a mock-up, and test the mock-up, in accordance with AAMA 1503.1.

d. Corrective Measures: Correct any deficiencies in the mock-ups observed during testing and repeat tests as may be required to show compliance with the performance standards. Deficiencies requiring repair or modification to the mockup(s) shall mandate a complete retesting of the mockup(s) beginning with the specified Preliminary Test unless otherwise directed by the Architect. If compliance with the performance standards is not achieved after 2 complete retests the Contractor shall bear all costs for additional retesting until compliance with the performance standards is accomplished. Incorporate corrective measures indicated by the test report into the final exterior wall assemblies after review by the Architect.

2. Field Testing: Upon completion of installation of an area of curtain wall acceptable to Architect, and as discussed at preconstruction meeting, test the curtain wall installation erected in accordance with the specified field test methods. Conduct tests of the installation under the direction of the testing laboratory in the presence of the Owner, Architect, the Contractor, various component manufacturers and fabricators and the installer for each specified system incorporated in the finished installations, including representatives of companies providing exterior wall finish materials.
   a. Field Test for Water Leakage:
      1) Water Spray Test without Static Air Pressure Difference: AAMA 501.2.
      2) Correct all deficiencies observed as a result of this test.
3. Pre-construction Sealant Compatibility and Adhesion Testing: Test results confirming compatibility and adhesion are mandatory for all concealed and exposed sealant materials in contact with exterior glazing, stone, precast, other sealants, flashings, metal framing, and shims prior to full size sample installation construction. Refer to Division 07 Section "Joint Sealants" for specific testing requirements, and anticipated lead-time necessary to perform testing.

D. Standards: Comply with the applicable provisions and recommendations of the following standards below, where standards conflict the more stringent shall apply:
   1. Aluminum Association (AA):
      a. No. 1 "Aluminum Standards and Data."
      b. "The Aluminum Design Manual."
   2. American Architectural Manufacturers Association (AAMA):
      a. AAMA "Metal Curtain Wall Manual."
      b. AAMA "Aluminum Curtain Wall Design Guide Manual," Volumes 1-9.
      c. AAMA "Curtain Wall Manual #10."
      d. AAMA 501.1, "Specification for Method of Test for Metal Curtain Walls for Water Penetration Using Dynamic Pressure."
      e. AAMA 501.2, "Specification for Field Check of Metal Curtain Walls for Water Leakage."
      f. AAMA 501.4, "Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts."
      g. AAMA 503, "Field Testing of Metal Store Fronts, Curtain Walls and Sloped Glazing Systems."
      h. AAMA 611, "Anodized Architectural Aluminum."
      i. AAMA 1801, "Acoustical Rating of Windows, Doors, and Glazed Wall Sections."
      j. AAMA TIR-A8-90, "Structural Performance Poured and Debridged Framing Systems."
   3. American Institute of Steel Construction (AISC), "Steel Construction Manual," Current Edition.
   4. American Society for Testing and Materials (ASTM):
      a. ASTM E283, "Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen."
      b. ASTM E330, "Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference."
      c. ASTM E331, "Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference."
      d. ASTM E783, "Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors."
      e. ASTM E1105, "Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference."
   5. National Association of Architectural Metal Manufacturers (NAAMM), "Metal Finishes Manual."
   6. Steel Structures Painting Council (SSPC): "Steel Structures Painting Manual, Vol. 2, Systems and Specifications."
   7. Federal Standard 16 CFR 1201, Consumer Product Safety Commission (CPSC): "Safety Standard for Architectural Glazing Materials," as published in the Code of Federal Regulations (CFR). Comply with the applicable requirements of the laws, codes, ordinances and regulations of Federal and Municipal authorities having jurisdiction, wherever requirements conflict the more stringent shall be required. Obtain approvals from all such authorities. As a minimum provide safety glazing complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
   8. Welding Standards: Welding shall be performed by skilled and qualified mechanics. Welding shall be performed in accordance with the applicable provisions of AWS D1.1 "Structural Welding Code - Steel" and AWS D1.2, "Structural Welding Code--Aluminum."

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Prior to the start of the curtain wall work, and at the Contractor's direction, meet at the site and review the construction schedule, availability of materials, installers personnel qualifications, equipment and facilities needed to make progress and avoid delays, installation procedures, testing, inspecting, and certification procedures, and coordination with other work. Meeting shall include Contractor, Owner, curtain wall installer, sealant installer, as well as any other subcontractors or material technical service representatives whose work, or products, must be coordinated with the curtain wall work.

1.5 IDENTIFICATION, DELIVERY, STORAGE, AND HANDLING

A. General: Comply with the applicable provisions of AAMA "Curtain Wall Manual #10" for the care and handling of curtain wall work from shop to site.

B. All components of the curtain wall work shall be identified after fabrication by marks clearly indicating their location in the building. Packaging of components shall be so selected to protect the components from damage during shipping and handling.

C. Storage on Site:
1. Store curtain wall components in a location and in a manner to avoid damage to the components. Stacking shall be done in a way that will prevent bending, excessive pressure, abrasion or other permanent damage of the component and its finished surfaces.
2. Store curtain wall components and materials in a clean, dry location, away from uncured concrete, masonry work, sprayed on fireproofing work, and other construction activities. Cover with non-staining waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.

D. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of metals.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of supporting structure by field measurements before fabrication so that the curtain wall work will be accurately designed, fabricated and fitted to the structure. Indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Use Contractor's lines and benchmarks as a basis for measurements.

1.7 WARRANTY

A. Special Warranty: Submit a 2-year written warranty, beginning from date of substantial completion, and executed by the Contractor, manufacturer and the curtain wall installer agreeing to repair or replace components of curtain wall systems that develop defects in materials or workmanship within the specified warranty period. Defects include, structural failures, sealant failures, deterioration of metals, metal finishes, and other materials beyond normal weathering, failure of operating components to function properly, uncontrolled water

leakage, uncontrolled air leakage, and any other evidence of failure or deterioration of the curtain wall work to meet performance requirements.

B. Warranty; Anodized Coatings: Submit a warranty for a period of 3 years, warranting that the anodized aluminum will not develop excessive fading or excessive non-uniformity of color or shade, and will not crack, peel, pit, or corrode; all within the limits defined as follows:
   1. "Excessive Fading" means a change in appearance which is perceptible and objectionable as determined by the Architect when viewed visually in comparison with the original color range samples.
   2. "Excessive Non-Uniformity" means non-uniform fading during the period of the warranty to the extent that adjacent panels have a color difference greater than the original acceptable range of color.
   3. "Will Not Pit or Otherwise Corrode" means there shall be no pitting or other type of corrosion discernable from a distance of 10 feet, resulting from the natural elements in the atmosphere at the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Curtain Wall -Basis-of-Design System: Subject to compliance with requirements, provide the **1600 Series by Kawneer North America, an Alcoa company**, or a comparable system, subject to review and approval of Architect, by one of the following:
   1. United States Aluminum.
   2. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
   3. YKK AP America Inc.

B. Punched Openings-Basis-of-Design System: Subject to compliance with requirements, provide the **6200T Sealair Window (fixed) Thermally Broken by Kawneer North America, an Alcoa company**, or a comparable system, subject to review and approval of Architect, by one of the following:
   1. United States Aluminum.
   2. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
   3. YKK AP America Inc.

2.2 MATERIALS

A. Aluminum: Conform to the requirements published in AA "Aluminum Standards and Data", referenced ASTM standards and the following. All aluminum extrusions shall be manufactured to dimensional tolerances so as to eliminate edge projection or misalignment at joints. Unless otherwise specified, provide alloy and temper as required to suit performance requirements and finish(es) indicated. Provide concealed extruded bars, rods, shapes and tubes in alloys as recommended by the fabricator to join or reinforce assembly of exposed aluminum components.
   1. Alloys:
      a. Sheet and Plate: Alloy 5005 and ASTM B 209, 'Anodizing Quality'.
      b. Extruded Bars, Rods, Shapes, and Tubes: Alloy 6063 and ASTM B 221, 'Anodizing Quality'.
      c. Bars, Rods, and Wire: ASTM B 211.

d. Sand Castings: ASTM B 26
e. Permanent Mold Castings: ASTM B 108.

2. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
3. Shapes and Thickness: Provide shapes as shown and as required to suit the performance requirements, with wall thickness of not less than the following:
   a. Minimum Wall Thickness for Extrusions: 1/8 inch.

B. Carbon Steel: For carbon steel components required to join, reinforce or support the assembly of aluminum components provide carbon steel conforming to ASTM A 36/A 36M for structural shapes, plates, and bars; ASTM A 1008/A 1008M for cold-rolled sheet and strip; or ASTM A 1011/A 1011M for hot-rolled sheet and strip.

C. Anchors and Fasteners:
1. Material: Series 300 stainless steel.
2. Anchor and Fastener Metal Alloy Types, Designations and Standards: Alloys as selected by fabricator to prevent corrosion resistance with the components fastened. Do not use self-drilling, self-tapping type fasteners.
3. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, complying with ASTM A 666, Type 304.

2.3 SEALING, GLASS AND GLAZING MATERIALS

A. Concealed Sealing Materials: All sealing materials concealed within the glazed aluminum curtain walls shall be silicone, compatible with and adherent to each material it will be in contact with, as recommended by the manufacturer to fulfill performance requirements.

B. Exposed Sealing Materials: All sealing materials exposed at glazed aluminum curtain wall perimeter joints in contact with adjacent cladding materials: Silicone, refer to Division 07 Section "Joint Sealants."

C. Glass and Glazing Materials: Refer to Division 08 Section "Glazing."

2.4 GLAZING

A. Glazing Sealants: As recommended by manufacturer.

2.5 OTHER GLAZED ALUMINUM CURTAIN WALL COMPONENTS

A. Thermal Isolators: Provide rigid plastic or nylon isolators of profile and hardness as recommended by the glazed aluminum curtain wall fabricator, and fabricated to a cross sectional profile to interlock with aluminum extrusions for thermal isolation of exterior window frame snap caps to interior window framing.

B. Slip and Separator Gaskets:
   1. Bolted Slip Joints: Non-metallic, low friction material bearing temperature and moisture resistances and low abrasion properties as required to suit performance requirements.
   2. Non-Bolted Slip Joints: Non-corrosive, non-toxic impregnated felt, or butyl tape with a pressure sensitive adhesive on one surface that is formulated for proper adhesion to metals indicated; gasket shall bear temperature and moisture resistance properties as required to suit performance criteria; thickness and width as required.

C. Baffle Material: Reticulated foam baffle material with a pore count (ppi) as required by assembly fabricator to suit performance requirements.

D. Snap In Sealant Stops: Provide rigid PVC sealant stops of profile and hardness as recommended by the window fabricator, and fabricated to a cross sectional profile to interlock with aluminum extrusions at all window perimeters.

2.6 FABRICATION

A. General: Fabricate the glazed aluminum curtain walls to the designs, shapes, and sizes shown, including radiused/curved framing members, using the materials specified and shown to produce assemblies that meet or exceed the performance requirements. To the greatest extent possible complete fabrication, assembly, finishing and other work before shipment to Project site.
   1. System Depth – Overall: 6 inches or 10-1/2 inches, as required.
   2. Exterior "snap cap" Face Dimension (Sightline): 2 1/2 inches.

B. Joints in Metal Work: All exposed work shall be carefully fitted and matched to produce continuity of line and design, with all joints, being accurately fitted for hairline contact and rigidly secured. Where additional rigidity or strength is required to satisfy the performance requirements reinforce curtain wall components with aluminum or carbon steel shapes, bars, and plates.

C. Shop Assembly: As far as practicable, all fitting and assembly work shall be done in a fabrication shop.

   1. Framing members attaching curtain wall components to building supports shall provide for 3-way adjustment to accommodate fabrication and construction tolerances, and allow for thermal and building movements.
   2. Provide vents, weepholes and internal water passages in the glazing framing recesses as recommended by the respective glass and framing manufacturers to conduct infiltrating water to the exterior, and to avoid condensation at glass spandrel unit air spaces. Provide weep baffles secured to inside of frame behind vents and weepholes.
      a. At third floor installation, the curtain wall is to be designed, fabricated, and installed to be exposed to weather on both sides of the system. The system shall resist passage of water, including wind-driven rain, to interior of system. System shall be designed to drain all infiltrating water to the exterior of the system.
   3. Provide for reglazing from exterior for all glass panels.

D. Internal Reinforcing: Where required, internally reinforce vertical mullions as required to utilize the same system throughout the Project.

E. Exposed Fasteners: Not permitted.

F. Protection of Metals: Wherever dissimilar metals are in contact, except in the case of aluminum in contact with galvanized steel, zinc, separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires. Wherever aluminum comes in contact with concrete surfaces separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires.

G. Welding: Complete the welding of exposed surfaces prior to finishing.
1. All welding shall be in accordance with the recommendations of the AWS and shall be performed with electrodes and/or by methods recommended by suppliers of the metal being welded. Fabricate welded aluminum assemblies so that fraying surfaces are free rinsing and will not trap coating solutions.
2. Welds behind finished surfaces shall be so performed as to eliminate distortion, and discoloration, on the finished side. Plug, puddle, and spot welding are not permitted. Provide low heat filled welds using a chill bar on finished side to eliminate dimpling, distortion, and/or discoloration on the finished side. If weld heads appear on the finished surface, the weld head shall be ground, and polished to match and blend with the finish on adjacent parent metal. Weld spatter and welding oxides on finished surfaces shall be removed immediately.
3. At joints where welding cannot be performed use concealed stainless steel fasteners to join assembly.

H. Shop Painting of Carbon Steel: Ungalvanized steel items shall be thoroughly cleaned of all loose scale, filings, dirt, and other foreign matter, in accordance with SSPC SP3 "Power Tool Clean," and painted with coating as specified for carbon steel surfaces.

2.7 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish Application:
1. Apply anodized coatings to all exposed surfaces of glazed aluminum curtain wall components, interior and exterior.
2. Adhesion and Compatibility Testing: Test samples of aluminum coatings on aluminum will be required for compatibility and adhesion testing of all sealants proposed for use on framing components. Refer to Division 07 Section "Joint Sealants."

C. Appearance of Finished Work: During production, maintain large size color range samples for use in comparing against production material. Variations in appearance of abutting or adjacent pieces are acceptable if they are within the range of approved samples. Noticeable variations in the same piece are not acceptable.

D. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

E. Class I, Clear Anodic Finish: Complying with AA-M10C22A41 for an Architectural Class I finish and the following:

1. Metal Preparation and Pretreatment: Remove die markings prior to finishing operations. Perform this work in addition to the finish specified. Scratches, abrasions, dents and similar defects are unacceptable.
2. Thickness: Minimum 0.7 mil, weighing not less than 27.0 mg per sq. in., minimum apparent density of 38 g per cubic in.
3. Performance Criteria: Meets or exceeding AAMA 611.
4. Color: Medium matte finished, clear natural anodized.
5. Post Anodizing Finish (Sealing): Anodized finishes shall be fully sealed by the manufacturer or processor according to procedures recommended by the licensor of the process. Maximum weight loss shall be 2.6 mg/ sq. in.

2.8 COATINGS FOR CONCEALED METAL SURFACES

A. General: The following protective coatings shall be applied to surfaces of metals which are to be concealed in the construction:
   1. Coating for Carbon Steel: Hot dip galvanized, complying with ASTM A123.
   2. Coating for Aluminum, and Carbon Steel: Where aluminum or carbon steel surfaces are to be in contact with each other or in contact with dissimilar materials such as masonry or concrete, and where hot dip galvanizing of carbon steel is incompatible with component parts because of galvanic action or component fabrication tolerances provide one of the following:
      a. Bituminous Paint: Cold-applied, non-sagging, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos. Apply in two coats for an overall minimum dry film thickness of 25 mils.
      b. Zinc Rich Primer: Organic zinc-rich primer, complying with SSPC-Paint 20.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate glazed aluminum curtain wall work with the work of other Sections and provide items to be placed during the installation of other work at the proper time to avoid delays in the work.

B. Place such items, including concealed overhead framing, accurately in relation to the final location of glazed aluminum curtain wall components.

3.2 EXAMINATION

A. Examine the substrates, adjoining construction, and conditions under which the Work is to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Before beginning installation of the glazed aluminum curtain wall work examine all parts of the existing building structural frame and the building cladding indicated to support the glazed aluminum curtain wall work. Notify Contractor in writing, of any dimensions, or conditions, found which will prevent the proper execution of the glazed aluminum curtain wall work, including specified tolerances. Use Contractor's offset lines and bench marks as basis of measurements.

3.3 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing glazed aluminum curtain wall systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Loose particles present or resulting from fabrication or field cutting and drilling shall be removed by blowing out joints with oil free compressed air, or by vacuuming joints. Remove protective coatings, oils from cutting and drilling operations, and residue on metallic surfaces with solvents that leave no residue. Do not allow solvent to air dry without wiping. Use only lint free towels for wiping of surfaces. Wipe metal surfaces with IPA (isopropyl alcohol) or xylene unless otherwise required by compatibility and adhesion testing results. Seal joints watertight. Clean excess joint sealants from finished surfaces.
   1. Cut and trim component parts of the glazed aluminum curtain wall work during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely to protect material and remove all evidence of cutting and trimming. Remove and replace members where cutting and trimming has impaired strength or appearance, as directed by Architect.
   2. Set components within the erection tolerances with uniform joints. Place components on shims and fasten to supporting substrates using bolts and similar fasteners. Use stainless steel shims at structural connections only. U shaped shims at structural connections are not permitted. Use aluminum, stainless steel, or high impact polystyrene shims at other connections.
   3. Do not erect components that are warped, deformed, bowed, dented, defaced or otherwise damaged as to impair its strength or appearance. Remove and replace members damaged in the process of erection.
   4. Coat concealed surfaces of dissimilar materials, and any ferrous metal components, with a heavy coating of bituminous paint, zinc rich primer or other separation in accordance with manufacturer's recommendations. Where aluminum components will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
   5. No holes or slots shall be burned, cut into, or field drilled in any building framing member without the written acceptance of the structural engineer.

B. Glazed Aluminum Curtain Wall Framing: Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.

C. Flashing: Install flashings fabricated from specified flashing material to the profiles shown. Flashings shall be furnished in single piece lengths. Laps and joints, where required, shall be lap seamed by a minimum of 4 inches with lap completely embedded in sealant. Mechanical fasteners shall be used where necessary to maintain contact of overlapping elements. Spot heads of all fasteners with sealant. Refer to Division 07 Section "Sheet Metal Flashing and Trim."

D. Install glazing to comply with requirements of Division 08 Section "Glazing," unless otherwise indicated.

E. Install perimeter sealant to comply with requirements of Division 07 Section "Joint Sealants," unless otherwise indicated.

F. Concealed Sealing Components: Apply sealant and gasket components which are integral to the glazed aluminum curtain wall systems in strict accordance with the each component

manufacturer's printed instructions. Before applying components remove all mortar, dust, dirt, moisture, and other foreign matter that will be deleterious to the intended performance of the component. Mask adjoining exposed surfaces to avoid spilling, dripping, dropping or other unintended contact of the sealing components onto adjacent exposed surfaces.

3.4 ERECTION TOLERANCES

A. The glazed aluminum curtain wall systems shall be fabricated and erected to accommodate the dimensional tolerances of the structural frame and surrounding cladding while providing the following as installed tolerances.
   1. Variation from theoretical calculated position as located in plan or elevation in relation to established floors lines, column lines and other fixed elements of the structure, including variations from plumb, level, straight and member size: +/- 1/4 inch max in any 20'-0" run, column-to-column bay, or floor-to-floor height.
   2. Alignment: Where surfaces abut in line, and meet at corners, limit offset from true alignment to 1/32 inch.
   3. Variation from angle, or plumb, shown: +/- 1/8 inch max in any 10'-0" run or story height, non-cumulative.
   4. Variation from slope, or level, shown: +/- 1/8 inch max in any 20'-0" run or column-to-column bay, non-cumulative.

3.5 ANCHORAGE

A. Anchorage of the glazed aluminum curtain wall work to the structure and surrounding cladding shall be in accordance with the accepted shop drawings.

3.6 WELDING

A. Weld with electrodes and by methods recommended by manufacturer of material being welded, and in accordance with AWS D1.1 for concealed steel members.

B. Welds and adjacent metal areas shall be thoroughly cleaned and coated with a single coat of bituminous paint.

3.7 REMOVAL OF DEBRIS

A. All debris caused by, or incidental to, the erection of the glazed aluminum curtain wall work shall be removed from the site and disposed of legally.

3.8 CLEANING

A. Clean metal surfaces promptly after installation, exercising care to avoid damage to factory finished exposed surfaces.

B. Wash glass on both faces not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer. Remove excess glazing and sealant compounds, dirt, and other substances.

C. Immediately remove any deleterious material from surfaces of aluminum.

3.9 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that glazed aluminum curtain wall work will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 08 4413
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SECTION 08 7100 – DOOR HARDWARE

PART 1 - GENERAL

2.10 1.01 SUMMARY

A. Section includes door hardware.

2.11 1.02 PREINSTALLATION MEETINGS

A. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
   1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
   2. Preliminary key system schematic diagram.
   3. Requirements for key control system.
   4. Address for delivery of keys.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to electrified door hardware including, but not limited to, the following:
   1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
   2. Review sequence of operation for each type of electrified door hardware.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review required testing, inspecting, and certifying procedures.

2.12 1.03 ACTION SUBMITTALS

A. Product Data: Submit product data including installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: Submit samples of exposed door hardware for each type indicated below, in specified finish. Tag with full description for coordination with the Door Hardware Schedule.
   1. Door Hardware: As follows:
      a. Locks and latches.
      b. Operating trim.
      c. Coat hooks.
   2. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

C. Door Hardware Schedule: Submit door hardware schedule prepared by or under the supervision of door hardware supplier. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware. The Architect's review of schedule shall neither be construed as a complete check nor shall it relieve the Contractor of responsibility for errors, deviations, or omissions from the specified requirements to provide complete door hardware for the project.
   1. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
      a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.
   2. Content: Include the following information:
      a. Type, style, function, size, label, hand, and finish of each door hardware item.
      b. Manufacturer of each item.
      c. Fastenings and other pertinent information.
      d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      e. Explanation of abbreviations, symbols, and codes contained in schedule.
      f. Mounting locations for door hardware. Supply templates to door and frame manufacturer(s) to enable proper and accurate sizing and locations of cutouts for hardware. Detail conditions requiring custom extended lip strikes, or other special or custom conditions.
      g. Door and frame sizes and materials.
      h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
         1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

D. Keying Schedule: Submit keying schedule prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

2.13 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

B. Warranties: Submit special warranties specified in this Section.

2.14 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware. Include final hardware and keying schedule.

2.15 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Supplier Qualifications: Door hardware supplier, who has completed a minimum of three (3) projects over the last 5 years which were similar in material, design and extent to that indicated for the project and which have resulted in construction with a record of successful in service performance, and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

D. Source Limitations: Obtain each type of door hardware from a single manufacturer, unless otherwise indicated.

E. Regulatory Requirements: Comply with the following:
1. Provide hardware items complying with the applicable provisions for accessibility and usability by the disabled and handicapped in compliance with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1, "Uniform Federal Accessibility Standards," California Code of Regulations, Title 24, Part 2 and California State Reference Code.
2. NFPA 101: Comply with applicable provisions for means of egress doors.
3. Electrified Door Hardware: Listed and classified by Underwriters Laboratories, Inc. or by a testing agency acceptable to authorities having jurisdiction, as suitable for the purpose indicated.

F. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by Underwriters Laboratories, Inc. for fire ratings indicated, based on testing according to NFPA 252. Provide only door hardware items that are identical to items tested by UL for the types and sizes of doors required. In case of conflict between type of hardware specified and type required for accessibility or fire protection, furnish type required by NFPA and UL. Doors indicated in fire rated partitions and walls shall be positive latching and self-closing, with smoke gaskets where required by applicable codes.
1. Wherever exit device hardware is required on doors, comply with UL 305. Furnish hardware to door manufacturer for installation at factory. Provide supplementary label, "Fire Exit Hardware," on each exit device to certify that panic hardware has been panic load tested with door.

2.16 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

2.17 1.08 COORDINATION

A. Coordinate layout and installation of recessed pivots and closers with floor construction.

B. Templates: Furnish templates and door hardware schedules, coordinated for the application of door hardware items with door and frame details, to door opening fabricators and trades performing door opening work to permit the preparation of doors and frames to receive the specified door hardware. Where the door hardware item scheduled is not adaptable to the finished size of door opening members requiring door hardware, submit an item having a similar operation and quality to the Architect for review. Each door hardware item shall be fabricated to templates.

C. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to, power supplies, fire alarm system and detection devices, access control system, security system, building control system.

D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

2.18 WARRANTY

A. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Faulty operation of door hardware.
   2. Deterioration of metals, metal finishes, and other materials beyond normal use.

B. Retain only the following items which are scheduled. Verify with manufacturers selected.

C. Warranty Period for Electromagnetic Locks: Five years from date of Substantial Completion.

D. Warranty Period for Manual Closers: Ten years from date of Substantial Completion.

E. Warranty Period for Concealed Floor Closers: Five years from date of Substantial Completion.

F. Warranty Period for Exit Devices: Five years from date of Substantial Completion.

G. Warranty Period for Other Hardware: Two years from date of Substantial Completion.

H. Warranty for Mortised Mechanical Lock and Latchsets: Ten years from date of Substantial Completion.

I. Warranty for Heavy Duty Cylindrical Mechanical Lock and Latchsets: Seven years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section, door hardware sets are keyed to each scheduled door in the door and frame schedule, and the Door Hardware Schedule at the end of Part 3.
   1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products.
   2. The hardware supplier shall review each hardware set and compare it with the door types, details, and sizes as shown and verify each hardware item for function, hand, backset, and method of fastening through shop drawing submittals.

2.02 HINGES AND PIVOTS

A. Butt Hinge Products and Manufacturers:
   1. Standard Weight, Ball Bearing, 5 Knuckle, Steel: Complying with BHMA A156.1 A8112, one of the following:
      a. BB5000; Bommer Industries, Inc., Landrum, SC (BI).
      b. BB1279; Hager Companies (HAG).
      c. TA2714; McKinney Products Company (MCK).
      d. FBB179; Stanley Commercial Hardware (STH).

B. Heavy Weight, Ball Bearing, 5 Knuckle, Steel: Complying with BHMA A156.1 A8111, one of the following:
      a. BB5004; Bommer Industries, Inc., Landrum, SC (BI).
      b. BB1168; Hager Companies (HAG).
      c. T4A3786; McKinney Products Company (MCK).
      d. FBB168; Stanley Commercial Hardware (STH).

C. Continuous Hinge Products and Manufacturers:
   3. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
   4. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
      a. FMHD-SLF-628, Bommer Industries, Inc.(BOM).
      b. 780-112HD, Full Mortise, Hager Companies (HAG).
      c. 112HD Full Mortise, IVES Hardware; an Ingersoll-Rand company (IVE).
      d. MCK-12HD, Full Mortise, McKinney Products Company; an ASSA ABLOY Group company (MCK).
      e. 661HD, Full Mortise, Stanley Commercial Hardware; Div. of The Stanley Works (STH).
      f. CFMSLFHD, Full Mortise, Pemko Manufacturing Co., Inc. (PEM).
      g. 910A, Full Mortise, Zero International.(ZRO)

D. General Hinge Characteristics: Where door jamb or trim projects to such an extent that the width of leaf specified will not allow the door to clear such frame or trim, furnish hinges and pivots with leaves of sufficient width to clear. Hinges shall be template hinges conforming to BHMA A156.1 and in accordance with door and frame material requirements.

E. Butt Hinge Quantity: Provide the following, unless otherwise indicated:
   1. Two Hinges: For doors with heights up to and including 60 inches (1524 mm).
   3. Three Hinges: For doors with heights of greater than 60 inches (1524 mm) to and including 90 inches (2286 mm).
   4. Four Hinges: For doors with heights greater than 90 inches (2286 mm) to and including 120 inches (3048 mm).
   5. Provide 4 hinges, plus 1 hinge for every 30 inches (750 mm) of door height greater than 120 inches (3048 mm).

F. Butt Hinge Sizes: 4-1/2 inches (114 mm) high by 4 inches (102 mm) or 4-1/2 inches (114 mm) wide for doors up to and including 36 inches (914 mm) in width; 5 inches (127 mm) high by 4 inches (102 mm) or 4-1/2 inches (114 mm) wide for doors greater than 36 inches (914 mm) in width.

G. Hinge Characteristics: Full mortise type with square corners. All butt hinges are to have non-rising pins. Provide only steel bodied butt and pivot hinges at labeled doors. All butt hinges shall be furnished with button tips. Provide heavy weight, ball bearing, hinges at doors 40 inches (1016 mm) and greater in width.

H. Electrified functions are available for full-mortise butt and pivot hinges.

I. Fasteners: Package all hinges and pivots with machine and wood screws as required by door and frame construction.

2.03 LOCKS AND LATCHES

A. Mortise Lock and Latch Sets: Heavy duty, commercial, mortise bodies complying with BHMA A156.13 Series 1000, Grade 1, with throughbolted lever trim. Furnish mortise type, field reversible without disassembly, field multifunctional without opening lock cases, lock and latch sets with 1 or 2 piece anti-friction deadlocking stainless steel latchbolts having a minimum 3/4 inch (19 mm) throw, 2-3/4 inches (70 mm) backset and UL Listed for 3 hours. All lock and latch sets, to be furnished complete with heavy 0.109 inch (2.77 mm) (12 gage) wrought steel zinc dichromate or chrome plated case, trim, adjustable beveled square cornered armored fronts, cold forged steel or stainless steel hubs, and 6 pin cylinders. Conceal fastenings, washers and bushings. Provide wrought, or black plastic, box strikes for each lock and latch set. Provide brass, bronze or stainless steel strikes with curved lips of sufficient length to protect frames. Provide solid forged or cast levers with wrought roses. Where lock functions are scheduled provide non-handed guard bolt and stainless steel deadbolt with a minimum 1 inch (25 mm) throw.
   1, Sargent 8200 Series, Sargent Manufacturing Company (SGT). Provide handed ANSI 4-7/8 inch curved lip strikes die punched to match bolts provided with latchset functions only, provide non-handed standard curve lip strikes 82-0110 for all other functions.
   5. Corbin-Russwin ML2000 Series, Corbin Russwin Architectural Hardware (CR). Provide handed ANSI 4-7/8 inch curved lip strikes die punched to match bolts provided with

latchset functions only 340L62 (RH) and 340L63 (LH), provide handed standard curve lip strikes for all other functions 340L60 (RH) and 340L61 (LH).

6. Schlage L9000 Series, Schlage Lock Company (SCH). Provide handed ANSI 4-7/8 inches curved lip strikes die punched to match bolts provided with latchset functions only (Part No. XL11-820/XL11-821), provide non-handed standard curve lip strikes for all other functions 10-072.

G. Trim:
   i. Studio Collection, Lever Aventura MW, CR Rose: Sargent Manufacturing Company (SGT)
   ii. Museo Collection, Lever 123, T Rose: Corbin Russwin Architectural Hardware (CR)

2.04 ELECTROMAGNETIC LOCKS

A. Concealed, Shear Type: Top mount application with a minimum 1000 pound holding force at 24 V, vertical armature adjustment thru edge of door, provide complete with all cabling, rectifier kits, holding force sensor, and mounting hardware, complying with BHMA A156.23, Grade 2, medium security, fail-safe operation.
   1. GF3000TRD; Locknetics (LSE).
   2. 1562-HTR Micro/Shear EmLock; Security Door Controls (SDC).
   3. Shear Aligning Magnalock (SAM); Securitron (SEC).

2.05 DOOR BOLTS

A. Manual Flush Bolts: Provide flush bolts, with 1 inch (25.4 mm) wide fronts, in paired sets (top and bottom), with 1/2 inch (12.7 mm) diameter flattened bolt tip for both wood and metal doors and standard 12 inch (304.8 mm) rod at flushbolts for metal doors. Flush bolts shall fit ANSI A115.4 door and frame preparation. Bolts to comply with BHMA A156.16, Type L14081, L14251, L04261 or L24081. Furnish rods of proper length to afford easy reach from the floor. Furnish manufacturer's standard top strikes for top bolts.
   1. Manual Flushbolts for Wood Doors: One of the following:
      a. No. 790F; Door Controls International (DCI).
      b. FB358; H. B. Ives (IVS).
      c. 3913; Triangle Brass Manufacturing Company, Inc. (TBM).
      d. 557; Rockwood Manufacturing Company (RM).
   2. Manual Flushbolts for Metal Doors: One of the following:
      a. No. 780F; Door Controls International (DCI).
      b. FB458; : H. B. Ives (IVE).
      c. 3917; Triangle Brass Manufacturing Company, Inc. (TBM).
      d. 555; Rockwood Manufacturing Company (RM).

B. Self-Latching Flush Bolt Assemblies for Metal Fire Doors: BHMA A156.3, Type 27; one of the following:
   1. No. 845 (805 top bolt x 840 automatic bottom bolt); Door Controls International (DCI).
   2. FB51P (FB51T constant latching top bolt x FB31B automatic bottom bolt; H. B. Ives (IVE).
   3. 3820 (3820 x 3810); Triangle Brass Manufacturing Company, Inc. (TBM).
   4. 1845 automatic flush bolt x constant self-latching top bolt; Rockwood Manufacturing Company (RM).

C. Self-Latching Flush Bolt Assemblies for Wood Fire Doors: BHMA A156.3, Type 27; one of the following:
1. No. 945 (905 top bolt x 940 automatic bottom bolt); Door Controls International (DCI).
2. FB41P (FB41T constant latching top bolt x FB41B automatic bottom bolt; H. B. Ives (IVS).
3. 3825L (3825L x 3815L); Triangle Brass Manufacturing Company, Inc. (TBM).
4. 1945 automatic flush bolt x constant self-latching top bolt; Rockwood Manufacturing Company (RM).

2.06 CYLINDERS AND KEYING

A. Cylinders: Full faced cylinders with square shouldered (not tapered) compression rings, 6 pin cylinders, standard threaded, keyed into building system, with cams to suit lock functions. Provide cylinders for installation into all locks.
1. 1100 Series Flexible Head Mortise Cylinder; Corbin Russwin Architectural Hardware (CR).
2. Series 40 Adjustable Front Cylinder; Sargent Manufacturing Company (SGT).
3. 30-001 full faced mortised cylinder with 36-083 compression rings; Schlage Lock Company (SCH).

B. Keying System: Final keying to determine lock cylinders, keyed alike sets, level of keying, master key groups, grandmaster keying system shall be as directed by the Owner. Supplier and Contractor shall meet with the Owner and obtain final instructions in writing. Provide 2 nickel silver keys for each lock, and 6 keys for each grandmaster and masterkey system. Provide 2 blank keys for each lock for the Owner's convenience in making additional keys.
1. Temporary Cylinders: Provide temporary cylinders in locks during construction and as may be necessary for security or as may be requested by the Owner. All temporary cylinders shall be individually keyed as required and subject to a single master key.

2.07 STRIKES

A. Strikes for Locks and Latches: All strikes for locks and latches shall be provided by the lock and latch manufacturer unless otherwise specified or scheduled, refer to Article 'Locks and Latches.'

B. Dustproof Floor Strikes: Complying with BHMA A156.16, Type L04251, L04021 or L14021, one of the following:
2. No. 80; Door Controls International.
3. DP2; H.B. Ives.(IVE)
4. 3910; Triangle Brass Manufacturing Company, Inc. (TBM).
5. 570 ; Rockwood Manufacturing Company (RM).

C. Dustproof Threshold Strikes: Complying with BHMA A156.16, Type L2402X or L14011, one of the following:
1. No. 81; Door Controls International.
2. DP1; H.B. Ives.
3. 3910N; Triangle Brass Manufacturing Company, Inc. (TBM).
4. 570 less plate; Rockwood Manufacturing Company (RM).

2.08 OPERATING TRIM (PUSHES AND PULLS)

A. Type 1: Fabricate push pulls for back to back mounting from 1 inch (25 mm) diameter stainless steel bar stock in finish as scheduled. Custom fabricate pulls with minimum 3-1/4 inch (83 mm) projection, 2-1/4 inch (57 mm) clearance, minimum 4 inch (102 mm) offset, 10 inch (245 mm) center to center of bases with center line of pull centered on door stiles. Furnish spanner turning washer and stud assemblies threaded to accept concealed throughbolt attachment including provision for spanner tightening of bolts of push/pull assembly. Do not provide baseplates at stile to pull interface. Provide one of the following:
1. 1191-3; Triangle Brass Manufacturing Company, Inc. (TBM).
2. BF157; Rockwood Manufacturing Company (RM).
3. 8190; H.B. Ives (IVE).

B. Type 2: Door pull and push plate for back to back mounting to swing doors. Fabricate pulls from 1-inch diameter stainless steel bar stock in finish as scheduled, with concealed mounting, minimum 2-1/2 inch clearance, and 10-inch center to center of bases. Fabricate push plates from minimum 0.050-inch thick plate for face of door mounting with exposed, self-drilling screws. Push plates to be 4 inches by 16 inches, with square corners, in finish as scheduled. Provide one of the following:
1. Door Pulls:
   a. 8103EZ; Ives: H. B. Ives (IVS).
   b. BF111C; Rockwood Manufacturing Company (RM).
   c. 7191; Triangle Brass Manufacturing Company, Inc. (TBM).
2. Push Plates:
   a. 8200; Ives: H. B. Ives (IVS).
   b. 70C; Rockwood Manufacturing Company (RM).
   c. 1001-3; Triangle Brass Manufacturing Company, Inc. (TBM).

2.09 ACCESSORIES FOR PAIRS OF DOORS

A. Tubular Coordinators and Filler Bars: UL listed for use on labeled doors and complying with BHMA A156.3, Type 21A. Provide with filler piece of length as required to close the header area and mounting brackets at stop mounted hardware. Furnish extenders at active leaf levers where required to clear overlapping astragals on doors installed with pocket pivot hinges or jambs with deep jamb stops.
7. No. 600 Series x Filler Bar; Door Controls International (DCI).
8. COR Series Coordinators x FL filler; H. B. Ives (IVE).
9. 1600 Series x FB Series Filler Bar; Rockwood Manufacturing Company (RM).

C. Astragals: UL listed for use on labeled doors, surface applied continuous extruded aluminum minimum 7/8 inch wide retaining EPDM gaskets for installation on both sides of all meeting stiles of doors:
iii. 125NA; National Guard Products, Inc. (NGP).
iv. 305CN; Pemko Manufacturing Co., Inc. (PEM).

2.10 CLOSERS

A. Surface-Mounted Closers: Closers shall be certified by ETL laboratories and the manufacturer to a minimum of 8,000,000 cycles and meet BHMA A156.4, Grade 1. Closers used in

conjunction with overhead stops and holders shall be templated and coordinated to function properly. Properly detail closers to meet application requirements by providing drop plates, brackets, etc. to meet application and installation requirements as indicated. Comply with manufacturer's recommendations for size of door closer depending on size of door, stack pressure conditions, and anticipated frequency of use. Closers shall have adjustable spring power, full rack and pinion, independent closing speed and latch regulating V-slotted valves, fully hydraulic with a high strength cast iron cylinder and solid forged steel arms, bore diameter of 1-1/2 inches (38.1 mm), pinion shaft diameter of 5/8 inches (15.87 mm), adjustable back check, cushion and built-in stop feature where scheduled, hold open arms where scheduled, delayed action where scheduled, arm finish to match closer cover finish scheduled. Provide metal covers of clean line design with plated or primed for paint finish as scheduled and that require removal in order to make adjustments to closer.

1. 4041; LCN Closers (LCN).

B. Overhead Concealed Closers, Butt and Offset Hung: Closers shall meet BHMA A156.4, Grade 1. Properly detail closers to meet application and installation requirements as indicated. Comply with manufacturer's recommendations for size of door closer depending on size of door, stack pressure conditions, and anticipated frequency of use. Provide manufacturer's standard cover plate finished to match exposed portions of butts or pivots provided.

1. 2030; LCN Closers (LCN).
2. RTS 85 Series, Transom Concealed Slide Arm; Dorma. (DOR)
3. 268; Sargent Manufacturing Company (SGT).

2.11 PROTECTIVE TRIM UNITS

A. Kick and Armor Plates: Fabricate protection plates from minimum 0.050 inch (1.3 mm) thick stainless steel, beveled top and 2 sides (B3E), square corners, complying with BHMA A156.6, and fastened with oval head Phillips fasteners countersunk into plate surface.

1. Series 8400; H. B. Ives (IVS).
2. K1050 Doorplate Series; Rockwood Manufacturing Company (RM).
3. KA050-2 Armor Plate and KOO50 for Kickplates; Triangle Brass Manufacturing Company, Inc. (TBM).

B. Size: Furnish kick and armor plates sized 2 inches (51 mm) less than door width. Furnish kickplates 12 inches (305 mm) high, furnish armor plates 48 inches (1219 mm) high unless otherwise indicated. Provide protective plates with cutouts for locks, louvers and windows to the extent indicated. Mount protective plates flush with bottom of door.

2.12 STOPS AND HOLDERS

A. Concealed Overhead Door Holders: Heavy duty, concealed mounting, full mortised, bronze bodied, slide track design, with heavy shock absorber spring providing 5 to 7 degree compression before deadstop, non-metal slide and shock blocks, 110 degree maximum opening, complying with BHMA A156.8 Type C11511 for hold open and Type C11541 for stop function. Provide stop, or hold open, functions as scheduled.

1. 1000 Series; Architectural Builders Hardware Mfg., Inc. (ABH).
2. 100 Series; Glynn-Johnson (GJ).
3. Checkmate Heavy Duty 1 Series; Rixson-Firemark, Inc. (RIX).

B. Floor Stops: Cast half dome design with rubber bumper, finish as scheduled. Provide manufacturer's standard riser heights as required for carpeted areas in conjunction with the floor bumpers scheduled.
   1. For Thresholds, Carpet and/or Undercut Doors: Comply with BHMA 156.16 Type L12161, L02161 or L12141.
      a. 3320X; Door Controls International (DCI).
      b. FS438; H.B. Ives (IVS).
      c. 1211; Triangle Brass Manufacturing Company, Inc. (TBM).
      d. 443; Rockwood Manufacturing Company (RM).
   2. For Doors with Standard 3/8 inch (9.5 mm) Clearance: Comply with BHMA 156.16 Type L12161, L02141 or L12141.
      a. 3310X; Door Controls International (DCI).
      b. FS436; H.B. Ives (IVE).
      c. 1211; Triangle Brass Manufacturing Company, Inc. (TBM).
      d. 441; Rockwood Manufacturing Company (RM).

C. Silencers for Metal Door Frames: BHMA A156.16, Type L03011; grey rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame, specifically designed to form an air pocket to absorb shock and reduce noise of door closing. Provide 2 silencers for each pair of doors, 3 silencers for each single door.

2.13 DOOR GASKETING

A. Type 1: Self adhesive flexible silicone type, continuous gaskets for installation at all heads and jambs of doors:
   1. 5050C; National Guard Products, Inc. (NGP).
   2. S88C; Pemko Manufacturing Co., Inc. (PEM).

B. Type 2: Continuous extruded aluminum automatic door bottoms with two lines of flexible, silicone type, continuous gaskets for surface installation at door bottoms.
   3. 220SA automatic door bottom; National Guard Products, Inc. (NGP).
   4. 412CSL automatic door bottom; Pemko Manufacturing Co., Inc. (PEM).

2.14 THRESHOLDS

A. Type 1: 1/2 inch (13 mm) high by 5 inches (127 mm) wide extruded aluminum double beveled saddle threshold.
   1. 412SA; Hager Companies (HAG).
   5. 171A; Pemko Manufacturing Co., Inc. (PEM).
   2. S205A; Reese Enterprises, Inc. (RE).
   3. 655A; Zero International, Inc. (ZRO).

2.15 SLIDING DOOR HARDWARE

A. Sliding Door Hardware: Provide complete sets consisting of continuous ball bearing hanger tracks, door hangers with provision for horizontal and vertical adjustments, floor guide, supports, track mounted stops, and rated for a door weight of 154 pounds (70 kg).
   1. Top Line Grant 73-134; Hettich International.

2. Media 70 – Hawa System, Hafele (HAF).

B. Sliding Door Pulls: Flush metal handles, nickel plated, matte finish
1. 151.09.609, Hafele (HAF).

2.16 MISCELLANEOUS DOOR HARDWARE

A. Coat Hooks: 1” x 2” x 4-3/8”, Stainless Steel.
1. Hat & Coat Hook 842.34.010; Hafele (HAF).

2.17 FABRICATION

A. Manufacturer's Nameplate: Provide each door hardware item without exposed manufacturers' labels, names, or designs.

C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips oval-head screws with finished heads to match surface of door hardware item being attached. Machine screws and expansion shields shall be used for attaching hardware to concrete and masonry. Use throughbolts for renovation work only where existing door blocking and reinforcements are unknown.
1. Concealed Fasteners: All new doors and door frames have been specified with adequate blocking and reinforcement provisions to eliminate exposed throughbolting of hardware items. Doors installed with exposed throughbolts will be rejected and replaced by the Contractor at no cost to the Owner. Where through bolts are used on existing doors provide sleeves for each through bolt.

2.18 FINISHES

A. Standard: Comply with BHMA A156.18.

B. Appearance of Finished Work: Finishes of the same designation, that come from 2 or more sources, shall match when the items are viewed at arm's length and approximately 24 inches (610 mm) apart. Unless otherwise scheduled, match each hardware item in a single hardware set with the scheduled latch or lock set finish. Painting of BHMA 600 (USP) surfaces is required and is specified under Division 09 Section "Painting."

C. Designations: The abbreviations used to schedule hardware finishes are generally BHMA (Federal Standards where indicated in parenthesis) designations. Comply with base material and finish requirements indicated by the following:
1. BHMA 626 (US26D): Satin chromium plated.
2. BHMA 628 (US28): Satin aluminum, clear anodized.
3. BHMA 630 (US32D): Satin stainless steel.
4. BHMA 689: Aluminum

PART 3 - EXECUTION

3.01 PREPARATION

A. Hardware for fire door assemblies shall be installed in accordance with NFPA 80. Hardware for smoke and draft control door assemblies shall be installed in accordance with NFPA 105. Install hardware for non-labeled and non-smoke and draft door assemblies in accordance with BHMA A156.115 for steel doors and frames, and BHMA A156.115-W series for wood doors, and hardware manufacturer's installation instructions for doors and frames fabricated from other than steel or wood.
   1. All modifications to fire doors and frame for electric and mortised hardware shall be made by the respective door and frame manufacturers.

B. Smoke Seals at S Labeled Door Assemblies: Provide and install smoke seals at S labeled doors in accordance with door manufacturer's instructions.

3.02 INSTALLATION

A. Mounting Heights: Mount door hardware units at the following heights, unless specifically indicated on the Drawings or required to comply with governing regulations:
   1. Locks and Latches: 38 inches (956 mm) to center of lever from finish floor.
   2. Door Pulls: 44 inches (1118 mm) from finish floor to center of grip. Pull bases centered on door stiles, unless otherwise indicated.
   3. Door Pulls: Pull bases centered on top and bottom door rails, and spaced from lock edge of door stile as indicated, or recommended, by the pull manufacturer.
   4. Push Plates: 44 inches (1118 mm) from finish floor to center of plate. Coordinate with pull location.
   5. Horizontal Push/Pull Bar: 42 inches (1067 mm) from finish floor to center of pull/pull. Push/Pull bases centered on door stiles, unless otherwise indicated.
   6. Butt Hinges: 10 inches (254 mm) to bottom of lowest hinge from finish floor; 5 inches (127 mm) to top of upper hinge from top of door; space intermediate hinges equally between lower and upper hinges.
   7. Deadbolts: Not more than 44 inches (1118 mm) from finish floor to operating trim.
   8. Flush Bolt Operating Mechanisms: Top bolt 66 to 72 inches (1676 to 1829 mm) from finish floor, bottom bolt 12 inches (305 mm) from finish floor.
   9. Exit Devices: 40 inches (1016 mm) from finish floor to center of touch bar. 38 inches (965 mm) from finish floor to center of cross bar.
   10. Coat Hooks: 54 inches from finish floor to center of coat hook.

B. Install each door hardware item to comply with manufacturer's written instructions. Install overhead surface closers for maximum degree of opening obtainable. Place on room side of corridor doors, stair side of stair doors, secondary corridor side of doors between corridors. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be finished, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

C. Do not install permanent key cylinders in locks until the time of preliminary acceptance by the Owner. At the time of preliminary acceptance, and in the presence of the Owner's

representative, permanent key all lock cylinders. Record and file all keys in the key control system specified, and turn system over to Owner for sole possession and control.

3.03 ADJUSTING

A. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every hardware component. Replace hardware components that cannot be adjusted to operate as intended. Adjust door control devices to compensate for building stack pressures, final operation of forced air mechanical equipment and to comply with referenced accessibility requirements.

B. Fire-Rated Door Assembly Testing: Upon completion of the installation, test each fire door assembly in the project to confirm proper operation of its closing device and that it meets all criteria of a fire door assembly as per NFPA 80 2007 Edition. The inspection of the fire doors is to be performed by individuals with knowledge and understanding of the operation components of the type of door being subjected to testing. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The record shall list each fire door assembly throughout the project, and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation. Clean hardware components as necessary to restore proper finish. Provide protection during the progress of the work and maintain conditions that ensure door hardware is in perfect working order and without damage or deterioration at time of Substantial Completion.

3.03 DOOR HARDWARE SCHEDULE

A. Refer to Drawings

END OF SECTION 08 7100

SECTION 08 71 13 – AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes concealed power door operators for swing doors, actuator, actuator bollard and related equipment for a fully operational system.

1.2 DEFINITIONS

A. Activation Device: A device that, when actuated, sends a signal to an automatic door operator to open a door.

B. Safety Device: Device that prevents a door from opening or closing.

1.3 ACTION SUBMITTALS

A. Product Data: Submit product data for each door operator type required. Include manufacturer's standard details, material descriptions, dimensions of individual components and profiles, certified performance reports, installation instructions, and parts lists.

B. Shop Drawings: Submit shop drawings showing fabrication and installation details for automatic door operators. Include locations and elevations of door openings indicating activation and safety devices.

1. Wiring Diagrams: Detail wiring for power operator, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Product Data: Submit product data for actuator bollard and installation ditails.

D. Samples: Submit 3 inch square samples for each exposed finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Reports: Submit field adjustment test reports.

B. Warranties: Submit specified warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Submit maintenance, emergency, and operation data for power door operators.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage a factory trained installer, with a minimum of 3 years successful experience in the installation of power door operators and, who is an authorized representative of the product manufacturer for both installation and maintenance of power door operators required for this Project.

B. Source Limitations: Obtain automatic door operators through one source from a single manufacturer.

C. BHMA Standard: Provide and install power door operators that comply with applicable requirements of BHMA A156.19, "Power Assist and Low Energy Power Operated Doors."

D. UL Standard: Provide power door operators that comply with UL 325. All electrical components, devices, and accessories shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authorities having jurisdiction, and marked for intended use.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of supporting structure by field measurements before fabrication so that the power door operator work will be accurately fabricated and fitted to the structure. Indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Use Contractor's lines and benchmarks as a basis for measurements.

1.8 COORDINATION

A. Templates: Obtain and distribute templates for doors, frames, and other work specified to be factory prepared for installing power door operators. Check shop drawings of adjacent work to confirm that adequate provisions are made for locating and installing power door operators to comply with indicated requirements.

B. Electrical System Roughing In: Coordinate layout and installation of power door operators with connections to power supplies and security access control systems (if any).

C. Provide templates for mounting of the actuator bollard.

1.9 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace components of the power door operator system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Faulty or sporadic operation of operator or activation and safety devices.
2. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.

C. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Transom Mounted Power Door Operator Products and Manufacturers: Provide electromechanical, transom mounted concealed, power door operators complying with BHMA A156.19 and UL 325. One of the following:

1. Series 4000 LE Heavy Duty Low Energy Door Operator; Horton Automatics Div. of Overhead Door Company.
2. Senior Swing; LCN, an Ingersoll-Rand Company.
3. Model 3000 Transom Mount Series; KM Systems.

A. Actuator Bollard: Subject to compliance with requirements, provide products by the following:
1. Wikk AccessAbility.
2. Other manufactures offering equal products.

2.2 GENERAL DOOR OPERATOR REQUIREMENTS

A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

1. Provide door operators with features for field adjustment of opening speed, closing speed, back check, hold open time, opening force, and acceleration during opening and recycling for soft start.
2. Provide door operators with precision machined gear systems, and motors, especially engineered and fabricated by the power door operator manufacturer for the use indicated. Fabricate gear systems and motors complete with sealed bearings, all weather lubricants and fluids, and vibration and noise isolation to provide long term, quiet and smooth service.
3. Provide door operators with microprocessor controls to accommodate site specific security system interface conditions such as required for card reader access, electric strike delay timers, electric strike power functions, electromechanical locks, and electromagnetic locks.
4. Provide door arm assemblies finished to match exposed housing.
5. Provide door operators that comply with NFPA 80 requirements for doors as emergency exits and that do not interfere with fire ratings.

B. Exposed Housing: Extruded aluminum cover, concealing all operating parts except arms and manual control switches, with provisions for maintenance access. Provide with fasteners concealed when door is in closed position. Provide exposed housing in manufacturer's standard

natural anodized finish complying with NAAMM AA-M12C22A31 (Architectural Class II Clear Anodized Coating) unless otherwise indicated. Match anodized finish on curtain wall.

2.3 SWINGING DOOR OPERATORS

A. Electromechanical Operators for Swinging Doors: Manufacturer's standard electromechanical unit with doors power opened and spring closed, with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, and with easy manual operation including spring closing when power is off. Provide operator action as indicated and mounting as follows:

1. Operator Mounting Type: Surface-mounted overhead operator.
2. Power-Assisted and Low-Energy Operators: Provide power-assisted and low-energy operators meeting requirements of BHMA A156.19 and ADA's "Accessibility Guidelines for Buildings and Facilities (ADAAG)" for "Automatic Doors and Power-Assisted Doors."
3. Fire-Door Accessories: Provide fire-door accessory package consisting of UL-listed latch mechanism, power-reset box, and caution labels for fire-resistance-rated doors indicated for electromechanical operation.
4. For center-pivoted doors, provide emergency release for reverse-swing action of doors indicated or required to function as exits.

2.4 OPERATOR CONTROLS

A. Wall Push-Plate Switches (Actuators): Manufacturer's standard semiflush, wall-mounted, door-control switch plate for operation by touch. Install a wall push plate actuator on each side of each automatic swinging entrance door.
1. Configuration: Rectangular push plate with 2 by 4 inch junction box for mounting in the curtain wall system, in mounting bollard or as shown on the drawings.
2. Push Plate Material: Stainless Steel.

B. Provide each push button actuator with graphic instructing the use operation and function of the door per ADA and local Code requirements.

2.5 ACCESSIRUES

A. Actuator Bollard: All welded construction, Stainless Steel ASTM A 240/240M,Type 304, #4 satin finish, 6 inches square, .120 inch thick minimum, flat stainless steel top, 42 inches high, prepped for recessed actuator as noted, with required concealed anchoring base.
1. Coordinate with concrete base work and electrical conduit requirements.

B. Key Switch: Recessed mounted, low voltage control switch with key controlled actuator enclosed in a 2 by 4 inch junction box.
1. Faceplate Material: stainless Steel.
2. Functions: On off switch for the automatic door operator.
3. Mounting: recessed mounted indoor jamb.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame supports, and other conditions affecting performance of power door operators. Examine roughing-in for electrical and security services to verify actual locations of connections, and to verify that the proper types of electrical and security services have been provided, before power door operator installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install complete power door operator system according to manufacturer's written instructions and BHMA A156.19, including activation and safety devices, control wiring, and remote power units.

3.3 ADJUSTING

A. Adjust power door operators and activation and safety devices to operate smoothly, easily, and properly, quietly, and for a safe operation and weathertight closure without binding, scraping, and excessive noise. Adjust doors with low energy door operators to function according to BHMA A156.19.

B. Lubricate operators, hardware and other moving parts.

C. Repair damaged exposed component finishes after completing power door operator installation.

END OF SECTION 08 71 13
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SECTION 08 8000 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows and window walls.
   2. Glazed entrances.

B. Related Sections:
   1. Refer to Division 07 " Joint Sealants" for glazing sealants.
   2. Refer to Division 08 "Aluminum Framed Entrances and Storefronts," for requirements applicable to single subcontract responsibility for glazing.
   3. Refer to Division 08 "Glazed Aluminum Curtain Walls," for requirements applicable to single subcontract responsibility for glazing.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide and install watertight and airtight glazing systems capable of withstanding thermal movement and wind and impact loads without failure of any kind, including loss or breakage of glass, failure of seal or gaskets, exudation of glazing sealants, and excessive deterioration of glazing materials.

B. Glass Design: The glass manufacturer shall be responsible for determining the appropriate glass size, thickness, and heat treating requirements, unless noted herein if necessary, based on performance criteria required by these Contract Documents; glazing requirements, such as edge distance, bite, etc.; fabrication tolerances; experience gathered from Project conditions and requirements, such as site orientation, shading patterns, or shading devices, etc; and manufacturer's in-house testing and development. However, no glass shall be thinner than 6 mm and all tinted glass shall be the same thickness, unless otherwise indicated. Sizes indicated on Drawings are for convenience only.

C. Thermal and Optical Performance Properties: Provide insulating glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
   1. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2-inch- wide interspace.
   2. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F.
   3. Optical Properties: NFRC 300.

1.3 SUBMITTALS

A. Product Data: Submit product data for each glass product and glazing material indicated.

B. Glass Manufacturers Letter: The glass manufacturer shall submit a letter certifying that he has reviewed the glazing details proposed for the project, including the use of gaskets and sealants, and that each product to be furnished is recommended for the application shown.

C. Thermal Stress and Wind Load Analyses: Submit the following from the glass manufacturer:
1. Thermal stress analysis for each exterior glass unit type, each building elevation. The analysis shall clearly indicate all the expected service temperature ranges and the effects of partial and full shading on the glass. Append to the thermal stress analysis a statement from the glass manufacturer that based upon this analysis that the resulting thermal stresses will not reduce the specified statistical probability of breakage.
2. Wind load analysis for each glass unit type, each building elevation. The analysis shall clearly indicate that the statistical probability of breakage at the design wind pressure will not exceed the specified statistical probability of breakage of 8 lites per thousand

D. Samples: Label samples to indicate product, characteristics, and locations in the work. Furnish samples of the following:
1. Except for clear glass, submit samples of each glass type specified, in the form of 12-inch- square Samples.
2. Submit samples of each glass type specified where production run variations, and defects are expected.

E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

F. Glass Treatment Certificates: Submit glass treatment certificates signed by manufacturer of the heat soaked glass products certifying that products furnished comply with requirements.

G. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

H. Product Test Reports: Submit product test reports for each type of glazing sealant and gasket indicated.

I. Warranties: Submit special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations for Glass and Glass Accessories: Obtain glass and glass accessories from one source for each product indicated below:
1. Primary glass.

2. Coated glass.
3. Heat treated glass.
4. Insulating glass.
5. Glazing gaskets.

C. Safety Glass: Comply with the applicable requirements of the laws, codes, ordinances and regulations of Federal and Municipal authorities having jurisdiction, wherever requirements conflict the more stringent shall be required. Obtain approvals from all such authorities. As a minimum provide Category II materials complying with testing requirements in 16 CFR 1201 (Consumer Product Safety Commission "Safety Standard for Architectural Glazing Materials**,"** as published in the Code of Federal Regulations) and ANSI Z97.1.
1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: GANA'S "Glazing Manual."

E. Sample Installations: Refer to Division 08 Section "Aluminum Framed Entrances and Storefronts," for requirements applicable to sample installations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting (using either breather or capillary tubes) and sealing.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty on Ceramic Frit Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements

for those coated-glass units whose coatings flake, peel, or crack within the specified warranty period indicated below. Upon notification of such deterioration within the warranty period furnish replacement glass units for those glass units whose coatings have flaked, peeled or cracked at the convenience of the Owner.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units whose hermetic seal has failed within specified warranty period indicated below. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass. Upon notification of such deterioration within the warranty period furnish replacement glass units for failed glass units at the convenience of the Owner.

1. Warranty Period: 10 years from date of Substantial Completion.

D. Heat Soaked Tempered Glass Warranty: Submit a 5 year written warranty, beginning from date of Substantial Completion, and executed by the Contractor, manufacturer and the glass installer agreeing to replace glass units that spontaneously break as a result of Nickel Sulfide (NiS) inclusions within the specified warranty period without material or labor charges to the Owner.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Refer to the drawings for the extent of glass types and locations. Glass types indicated on the drawings are keyed to the Part 3 Glass Schedule Articles at the end of this section. The Contractor shall confirm the levels of heat treatment required for each glass type scheduled as contained in Articles Performance Requirements, Submittals and Quality Assurance.

2.2 PRIMARY FLOAT GLASS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

2.3 HEAT-TREATED FLOAT GLASS

A. General: Heat treat glass where the need is determined by thermal stress analyses, by wind load analyses, and where required to meet safety glazing requirements.

B. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of installed glass unit.

C. Sizes and Cutting: Prior to heat treatment, cut glass to required sizes as determined by accurate measurement of openings to be glazed, making allowance for required edge clearances. Cut and process edges in accordance with glass manufacturer's recommendations. Do not cut or treat edges in the field.

D. Heat-Strengthened Glass: Provide glass complying with ASTM C1048 Kind HS. Surface compression range shall be between 4,000 psi and 7,000 psi.

E. Fully Tempered Glass: Provide glass complying with ASTM C1048 Kind FT and meeting the requirements of ANSI Z97.1. Surface compression shall be equal to or greater than 10,000 psi.
   1. Heat Soaking: Where noted, after tempering, heat soak 100% of all fabricated glass units to European Union Standard EN14179 to eliminate inclusion related glass breakage. Statistical heat soaking shall not be permitted.
      a. Provide heat soaked tempered glass at all outboard lites of insulated glass.
      b. Provide safety glass permanently marked with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

F. Flatness Tolerances: All heat treated glass shall be fabricated to the following flatness tolerances:
   1. Overall Bow and Warp: Not greater than the maximum bow and warp tolerances in any direction as listed in ASTM C1048 Table 2. Localized warp limited to 1/32 inch in 12 inches.
   2. Roll Ripple: The deviation from flatness at any peak (peak to valley deviation) shall not exceed 0.003 inches for 6 mm thick glass.

2.4 COATED FLOAT GLASS

A. General: Provide coated glass complying with requirements indicated in this Article and in schedules at the end of Part 3.
   1. Coating Quality: The allowable range of defects in coatings applied to glass shall be as accepted through glass sample submissions. Installed coated glass products which are outside of the accepted sample range shall be subject to rejection by the Architect. In order to reduce the possibility of glass rejection, the supplier of coated glass products shall provide glass coating production runs for the entire project from a single coating facility. The allowable range of defects are defined as follows:
      a. The vision glass area is defined as the field of glass which is greater than 3 inches from the glass unit edge.
         1) Pinholes: At an indoor viewing distance of 6 feet for low emissivity coatings, and 15 feet for reflective coatings:
            a) Pinholes greater than 1/16 inch in dia. shall not be permitted;
            b) Large clusters or close spacing of pinholes 1/16 inch and smaller shall not be permitted in the vision glass area; and
            c) Large clusters or close spacing of pinholes 1/16 inch and smaller may be permitted outside of the vision glass area subject to Architect's acceptance.
         2) Scratches: At an indoor viewing distance of 10 feet for low emissivity coatings, and 15 feet for reflective coatings:
            a) Scratches smaller than 3 inches long are allowed in any glass area;
            b) Scratches from 3 inches to 5 inches long are allowed only within 3 inches of an edge.
            c) Scratches greater than 5 inches long shall not be permitted in the vision glass area.
            d) Concentrated scratches, scuffs, rub marks, cup marks or abraded areas shall not be permitted in any glass area.
         3) Reflectance and Transmission Inspection: When viewed outdoors against a bright uniform opaque background at a distance of 10 feet for low emissivity coatings (15 feet for reflective coatings), color, reflectance and

transmission will be permitted to have a slight variance subject to Architect's acceptance.

a) Mottling and streaking of the coating shall not be permitted.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Preassembled units, with dehydrated entrapped air, consisting of sheets of glass hermetically sealed at all edges with a polyisobutylene primary and a silicone secondary elastomeric sealant. The lites of glass shall be separated by dessicant containing aluminum spacers. All insulating glass units shall be IGCC certified to comply with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.

1. Provide Kind HS (heat-strengthened) float glass where needed to comply with "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated or required by authority having jurisdiction.

B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

2.6 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Gasket, Blocking, and Spacer Wet Glazing Materials: Silicone, compatible with and adherent to each material it will be in contact with, as recommended by the manufacturer to fulfill performance requirements.

C. Butt Glazing Sealants: Refer to Division 07 Section "Joint Sealants."

2.7 GLAZING GASKETS

A. Dense Compression Gaskets: Continuous extruded silicone or silicone compatible rubber with cross sectional profile, physical properties, and tolerances as recommended by the storefront manufacturer, and as required, to comply with the performance requirements specified and shown all in compliance with the applicable provisions of ASTM C1115, Type C for silicone or complying with ASTM C864 (Option II) for silicone compatible rubber.

B. Soft Compression Gaskets: Continuous extruded expanded foam with, cross sectional profile, physical properties, and tolerances as recommended by the storefront manufacturer, and as required, to comply with the performance requirements specified and shown all in compliance with the applicable provisions of ASTM C509, Option II, Type II; provide one of the following:

1. Silicone.
2. Silicone compatible rubber.

C. Continuous Structural Gaskets/Spacers: Continuous extruded silicone or silicone compatible rubber, with cross sectional profile, physical properties, and tolerances as recommended by the window and storefront manufacturer, and as required, to comply with the performance requirements specified and shown. Gaskets/Spacers shall be tested for compatibility with silicone sealants and shall be subject to the acceptance of the sealant manufacturer.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces, and wet glazing materials, contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Silicone complying with ASTM C1115 (Type C), blocks, 85 +/- 5 Shore A durometer hardness, 1/16 inch less than the channel width, and length based on the square footage of the glass unit to be supported in accordance with GANA standards and glass manufacturer recommendations but not less than 4 inches.

D. Edge Blocks: Silicone complying with ASTM C1115 (Type C), blocks, 65 +/- 5 Shore A durometer hardness, minimum 4 incheslong and sized to allow 1/8 inch clearance between edge of glass and block.

E. Temporary Setting Clamps/Cleats: Removable type as recommended by storefront manufacturer to temporarily retain glazing units during curing period of structural silicone sealant.

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

1. Edge and Surface Conditions: Comply with the recommendations of AAMA "Structural Properties of Glass" for "clean-cut" edges, except comply with manufacturer's recommendations when they are at variance therewith.
2. Exposed Glass Edges and Surface Condition: All edges shall be flat with an arrissed edge profile (small bevel of uniform width not exceeding 1.5 mm at an angle of approximately 45 degrees to the surface of the glass) with a polished (surface is reflective in appearance similar to the major surface of the glass) surface.

B. Cutting: Do not nip glass edges. Edges may be wheel cut or sawed and seamed at manufacturer's option. For glass to be cut at site, provide glass 2 inches larger than required in both dimensions, so as to facilitate cutting of clean cut edges without the necessity of seaming or nipping. Do not cut, seam, nip or abrade heat-treated glass.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier and glass framing erector present, for compliance with the following:
   1. Compliance with the specified manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep system.
   3. Minimum required face or edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing stops, glazing channels, and rabbets which will be in contact with the glazing materials immediately before glazing.
   1. Remove coatings that might fail in adhesion or interfere with bond of sealants.
   2. Comply with manufacturers instructions for final wiping of surfaces immediately before application of primers.
   3. Wipe metal surfaces with IPA (isopropyl alcohol) unless otherwise required by compatibility and adhesion testing results.

B. Prime surfaces to receive glazing compounds. When priming, comply with wet glazing manufacturers recommendations.

C. Inspect each piece of glass immediately before installation. Do not install any pieces which are improperly sized or have damaged edges, scratches or abrasion or other evidence of damage. Remove labels from glass immediately after installation.

D. Seal vent (breather or capillary) tubes in insulating glass units in accordance with the insulating glass manufacturers written recommendations.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
   1. All glass units shall be installed in accordance with the glass manufacturers recommendations.
      a. Structurally Glazed Insulating Glass Units: Set full height continuous structural gaskets/spacers to vertical mullions. Set glass units with void between edge of units and head/sill channel, but with units fully within head/sill rebate so as to provide a proper bite. Align glass unit edges over vertical mullion continuous structural gasket/spacers and secure with manufacturers recommended temporary cleats. Structurally seal glass unit to vertical mullions with specified one-part structural silicone sealant. Tool structural silicone flush in alignment to mullion

face and perpendicular to face of interior glass light; remove excess structural silicone from glass and metal substrates. After full cure of structural silicone sealant remove temporary cleats. Any holes left in the vertical mullions which were caused by the temporary cleats shall be sealed immediately. Insert and shape weatherseal joint backer rods, or gaskets, into vertical void between glass units and at a proper depth to receive silicone weatherseal sealant. Place silicone weatherseal sealant into void and tool flush with adjacent exterior glass light faces; remove excess sealant from glass and metal substrates.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to surfaces indicated to receive glazing materials. Use primers as determined by preconstruction compatibility and adhesion testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless more stringent requirements are recommended by glass manufacturer. Place blocks to allow water passage to weep holes.
   1. For Glass Units Less Than 72 inches: Locate setting blocks at sill one-quarter of the width in from each end of the glass unless otherwise recommended by the glass manufacturer.
   2. For Glass Units 72 inches or Greater: Locate setting blocks at sill one-eighth of the width in from each end of the glass, but not less than 6 inches, unless otherwise recommended by the glass manufacturer.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide edge blocking at edges of glass walls to prevent glass lites from moving sideways in glazing channel, sized and located to comply with the glass manufacturers recommendations and the requirements in referenced glazing publications.
   1. Edge blocking will not be required at structural glazed window walls, except at edges where window walls abut other construction, unless specifically required by the glass manufacturer for the conditions shown.

H. Set glass lites with uniform pattern, draw, bow, and similar characteristics, producing the greatest possible degree of uniformity in appearance on the entire exterior wall elevation.
   1. Set glass units with void between edge of units and glazing channel.
   2. Orient and install insulating glass units made up with one light of low emissivity coated glass with the uncoated glass light on the inboard (building) side.

3.4 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way and from any source, including natural causes, accidents, and vandalism.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.5 GLASS SCHEDULE – EXTERIOR GLAZING

A. Vision Glass Units – Insulated Units:
1. Glass Type 1 (GL-01): 1” insulating unit.
a. Basis-of-Design Product and Manufacturer: PPG Solarban 70XL;
b. Type FT (fully tempered).
c. Unit Makeup:
1) Outboard Lite: Class 1 (clear), 1/4” thick minimum glass lite, with low emissivity coating located on the #2 surface.
2) Space: 1/2”; air filled.
3) Inboard Lite: Class 1 (Starphire), 1/4” thick minimum glass lite.
d. Performance Criteria: 66 % minimum.
1) U-value (summer): 0.26.
2) U-value (winter): 0.28.
3) Solar Heat Gain (SHGC): 0.28 maximum.
4) Shading Coefficient (SC): 0.32

END OF SECTION 08 8000
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SECTION 08 8000 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows and window walls.
   2. Glazed entrances.

B. Related Sections:
   1. Refer to Division 07 " Joint Sealants" for glazing sealants.
   2. Refer to Division 08 "Aluminum Framed Entrances and Storefronts," for requirements applicable to single subcontract responsibility for glazing.
   3. Refer to Division 08 "Glazed Aluminum Curtain Walls," for requirements applicable to single subcontract responsibility for glazing.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide and install watertight and airtight glazing systems capable of withstanding thermal movement and wind and impact loads without failure of any kind, including loss or breakage of glass, failure of seal or gaskets, exudation of glazing sealants, and excessive deterioration of glazing materials.

B. Glass Design: The glass manufacturer shall be responsible for determining the appropriate glass size, thickness, and heat treating requirements, unless noted herein if necessary, based on performance criteria required by these Contract Documents; glazing requirements, such as edge distance, bite, etc.; fabrication tolerances; experience gathered from Project conditions and requirements, such as site orientation, shading patterns, or shading devices, etc; and manufacturer's in-house testing and development. However, no glass shall be thinner than 6 mm and all tinted glass shall be the same thickness, unless otherwise indicated. Sizes indicated on Drawings are for convenience only.

C. Thermal and Optical Performance Properties: Provide insulating glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
   1. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2-inch- wide interspace.
   2. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F.
   3. Optical Properties: NFRC 300.

1.3 SUBMITTALS

A. Product Data: Submit product data for each glass product and glazing material indicated.

B. Glass Manufacturers Letter: The glass manufacturer shall submit a letter certifying that he has reviewed the glazing details proposed for the project, including the use of gaskets and sealants, and that each product to be furnished is recommended for the application shown.

C. Thermal Stress and Wind Load Analyses: Submit the following from the glass manufacturer:
1. Thermal stress analysis for each exterior glass unit type, each building elevation. The analysis shall clearly indicate all the expected service temperature ranges and the effects of partial and full shading on the glass. Append to the thermal stress analysis a statement from the glass manufacturer that based upon this analysis that the resulting thermal stresses will not reduce the specified statistical probability of breakage.
2. Wind load analysis for each glass unit type, each building elevation. The analysis shall clearly indicate that the statistical probability of breakage at the design wind pressure will not exceed the specified statistical probability of breakage of 8 lites per thousand

D. Samples: Label samples to indicate product, characteristics, and locations in the work. Furnish samples of the following:
1. Except for clear glass, submit samples of each glass type specified, in the form of 12-inch- square Samples.
2. Submit samples of each glass type specified where production run variations, and defects are expected.

E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

F. Glass Treatment Certificates: Submit glass treatment certificates signed by manufacturer of the heat soaked glass products certifying that products furnished comply with requirements.

G. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

H. Product Test Reports: Submit product test reports for each type of glazing sealant and gasket indicated.

I. Warranties: Submit special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations for Glass and Glass Accessories: Obtain glass and glass accessories from one source for each product indicated below:
1. Primary glass.

2. Coated glass.
3. Heat treated glass.
4. Insulating glass.
5. Glazing gaskets.

C. Safety Glass: Comply with the applicable requirements of the laws, codes, ordinances and regulations of Federal and Municipal authorities having jurisdiction, wherever requirements conflict the more stringent shall be required. Obtain approvals from all such authorities. As a minimum provide Category II materials complying with testing requirements in 16 CFR 1201 (Consumer Product Safety Commission "Safety Standard for Architectural Glazing Materials**,"** as published in the Code of Federal Regulations) and ANSI Z97.1.
1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: GANA'S "Glazing Manual."

E. Sample Installations: Refer to Division 08 Section "Aluminum Framed Entrances and Storefronts," for requirements applicable to sample installations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting (using either breather or capillary tubes) and sealing.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty on Ceramic Frit Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements

for those coated-glass units whose coatings flake, peel, or crack within the specified warranty period indicated below. Upon notification of such deterioration within the warranty period furnish replacement glass units for those glass units whose coatings have flaked, peeled or cracked at the convenience of the Owner.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units whose hermetic seal has failed within specified warranty period indicated below. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass. Upon notification of such deterioration within the warranty period furnish replacement glass units for failed glass units at the convenience of the Owner.

1. Warranty Period: 10 years from date of Substantial Completion.

D. Heat Soaked Tempered Glass Warranty: Submit a 5 year written warranty, beginning from date of Substantial Completion, and executed by the Contractor, manufacturer and the glass installer agreeing to replace glass units that spontaneously break as a result of Nickel Sulfide (NiS) inclusions within the specified warranty period without material or labor charges to the Owner.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Refer to the drawings for the extent of glass types and locations. Glass types indicated on the drawings are keyed to the Part 3 Glass Schedule Articles at the end of this section. The Contractor shall confirm the levels of heat treatment required for each glass type scheduled as contained in Articles Performance Requirements, Submittals and Quality Assurance.

2.2 PRIMARY FLOAT GLASS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

2.3 HEAT-TREATED FLOAT GLASS

A. General: Heat treat glass where the need is determined by thermal stress analyses, by wind load analyses, and where required to meet safety glazing requirements.

B. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of installed glass unit.

C. Sizes and Cutting: Prior to heat treatment, cut glass to required sizes as determined by accurate measurement of openings to be glazed, making allowance for required edge clearances. Cut and process edges in accordance with glass manufacturer's recommendations. Do not cut or treat edges in the field.

D. Heat-Strengthened Glass: Provide glass complying with ASTM C1048 Kind HS. Surface compression range shall be between 4,000 psi and 7,000 psi.

E. Fully Tempered Glass: Provide glass complying with ASTM C1048 Kind FT and meeting the requirements of ANSI Z97.1. Surface compression shall be equal to or greater than 10,000 psi.
   1. Heat Soaking: Where noted, after tempering, heat soak 100% of all fabricated glass units to European Union Standard EN14179 to eliminate inclusion related glass breakage. Statistical heat soaking shall not be permitted.
      a. Provide heat soaked tempered glass at all outboard lites of insulated glass.
      b. Provide safety glass permanently marked with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

F. Flatness Tolerances: All heat treated glass shall be fabricated to the following flatness tolerances:
   1. Overall Bow and Warp: Not greater than the maximum bow and warp tolerances in any direction as listed in ASTM C1048 Table 2. Localized warp limited to 1/32 inch in 12 inches.
   2. Roll Ripple: The deviation from flatness at any peak (peak to valley deviation) shall not exceed 0.003 inches for 6 mm thick glass.

2.4 COATED FLOAT GLASS

A. General: Provide coated glass complying with requirements indicated in this Article and in schedules at the end of Part 3.
   1. Coating Quality: The allowable range of defects in coatings applied to glass shall be as accepted through glass sample submissions. Installed coated glass products which are outside of the accepted sample range shall be subject to rejection by the Architect. In order to reduce the possibility of glass rejection, the supplier of coated glass products shall provide glass coating production runs for the entire project from a single coating facility. The allowable range of defects are defined as follows:
      a. The vision glass area is defined as the field of glass which is greater than 3 inches from the glass unit edge.
         1) Pinholes: At an indoor viewing distance of 6 feet for low emissivity coatings, and 15 feet for reflective coatings:
            a) Pinholes greater than 1/16 inch in dia. shall not be permitted;
            b) Large clusters or close spacing of pinholes 1/16 inch and smaller shall not be permitted in the vision glass area; and
            c) Large clusters or close spacing of pinholes 1/16 inch and smaller may be permitted outside of the vision glass area subject to Architect's acceptance.
         2) Scratches: At an indoor viewing distance of 10 feet for low emissivity coatings, and 15 feet for reflective coatings:
            a) Scratches smaller than 3 inches long are allowed in any glass area;
            b) Scratches from 3 inches to 5 inches long are allowed only within 3 inches of an edge.
            c) Scratches greater than 5 inches long shall not be permitted in the vision glass area.
            d) Concentrated scratches, scuffs, rub marks, cup marks or abraded areas shall not be permitted in any glass area.
         3) Reflectance and Transmission Inspection: When viewed outdoors against a bright uniform opaque background at a distance of 10 feet for low emissivity coatings (15 feet for reflective coatings), color, reflectance and

transmission will be permitted to have a slight variance subject to Architect's acceptance.

a) Mottling and streaking of the coating shall not be permitted.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Preassembled units, with dehydrated entrapped air, consisting of sheets of glass hermetically sealed at all edges with a polyisobutylene primary and a silicone secondary elastomeric sealant. The lites of glass shall be separated by dessicant containing aluminum spacers. All insulating glass units shall be IGCC certified to comply with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.

1. Provide Kind HS (heat-strengthened) float glass where needed to comply with "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated or required by authority having jurisdiction.

B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

2.6 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Gasket, Blocking, and Spacer Wet Glazing Materials: Silicone, compatible with and adherent to each material it will be in contact with, as recommended by the manufacturer to fulfill performance requirements.

C. Butt Glazing Sealants: Refer to Division 07 Section "Joint Sealants."

2.7 GLAZING GASKETS

A. Dense Compression Gaskets: Continuous extruded silicone or silicone compatible rubber with cross sectional profile, physical properties, and tolerances as recommended by the storefront manufacturer, and as required, to comply with the performance requirements specified and shown all in compliance with the applicable provisions of ASTM C1115, Type C for silicone or complying with ASTM C864 (Option II) for silicone compatible rubber.

B. Soft Compression Gaskets: Continuous extruded expanded foam with, cross sectional profile, physical properties, and tolerances as recommended by the storefront manufacturer, and as required, to comply with the performance requirements specified and shown all in compliance with the applicable provisions of ASTM C509, Option II, Type II; provide one of the following:

1. Silicone.
2. Silicone compatible rubber.

C. Continuous Structural Gaskets/Spacers: Continuous extruded silicone or silicone compatible rubber, with cross sectional profile, physical properties, and tolerances as recommended by the window and storefront manufacturer, and as required, to comply with the performance requirements specified and shown. Gaskets/Spacers shall be tested for compatibility with silicone sealants and shall be subject to the acceptance of the sealant manufacturer.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces, and wet glazing materials, contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Silicone complying with ASTM C1115 (Type C), blocks, 85 +/- 5 Shore A durometer hardness, 1/16 inch less than the channel width, and length based on the square footage of the glass unit to be supported in accordance with GANA standards and glass manufacturer recommendations but not less than 4 inches.

D. Edge Blocks: Silicone complying with ASTM C1115 (Type C), blocks, 65 +/- 5 Shore A durometer hardness, minimum 4 incheslong and sized to allow 1/8 inch clearance between edge of glass and block.

E. Temporary Setting Clamps/Cleats: Removable type as recommended by storefront manufacturer to temporarily retain glazing units during curing period of structural silicone sealant.

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

1. Edge and Surface Conditions: Comply with the recommendations of AAMA "Structural Properties of Glass" for "clean-cut" edges, except comply with manufacturer's recommendations when they are at variance therewith.
2. Exposed Glass Edges and Surface Condition: All edges shall be flat with an arrissed edge profile (small bevel of uniform width not exceeding 1.5 mm at an angle of approximately 45 degrees to the surface of the glass) with a polished (surface is reflective in appearance similar to the major surface of the glass) surface.

B. Cutting: Do not nip glass edges. Edges may be wheel cut or sawed and seamed at manufacturer's option. For glass to be cut at site, provide glass 2 inches larger than required in both dimensions, so as to facilitate cutting of clean cut edges without the necessity of seaming or nipping. Do not cut, seam, nip or abrade heat-treated glass.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier and glass framing erector present, for compliance with the following:
   1. Compliance with the specified manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep system.
   3. Minimum required face or edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing stops, glazing channels, and rabbets which will be in contact with the glazing materials immediately before glazing.
   1. Remove coatings that might fail in adhesion or interfere with bond of sealants.
   2. Comply with manufacturers instructions for final wiping of surfaces immediately before application of primers.
   3. Wipe metal surfaces with IPA (isopropyl alcohol) unless otherwise required by compatibility and adhesion testing results.

B. Prime surfaces to receive glazing compounds. When priming, comply with wet glazing manufacturers recommendations.

C. Inspect each piece of glass immediately before installation. Do not install any pieces which are improperly sized or have damaged edges, scratches or abrasion or other evidence of damage. Remove labels from glass immediately after installation.

D. Seal vent (breather or capillary) tubes in insulating glass units in accordance with the insulating glass manufacturers written recommendations.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
   1. All glass units shall be installed in accordance with the glass manufacturers recommendations.
      a. Structurally Glazed Insulating Glass Units: Set full height continuous structural gaskets/spacers to vertical mullions. Set glass units with void between edge of units and head/sill channel, but with units fully within head/sill rebate so as to provide a proper bite. Align glass unit edges over vertical mullion continuous structural gasket/spacers and secure with manufacturers recommended temporary cleats. Structurally seal glass unit to vertical mullions with specified one-part structural silicone sealant. Tool structural silicone flush in alignment to mullion

face and perpendicular to face of interior glass light; remove excess structural silicone from glass and metal substrates. After full cure of structural silicone sealant remove temporary cleats. Any holes left in the vertical mullions which were caused by the temporary cleats shall be sealed immediately. Insert and shape weatherseal joint backer rods, or gaskets, into vertical void between glass units and at a proper depth to receive silicone weatherseal sealant. Place silicone weatherseal sealant into void and tool flush with adjacent exterior glass light faces; remove excess sealant from glass and metal substrates.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to surfaces indicated to receive glazing materials. Use primers as determined by preconstruction compatibility and adhesion testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless more stringent requirements are recommended by glass manufacturer. Place blocks to allow water passage to weep holes.
   1. For Glass Units Less Than 72 inches: Locate setting blocks at sill one-quarter of the width in from each end of the glass unless otherwise recommended by the glass manufacturer.
   2. For Glass Units 72 inches or Greater: Locate setting blocks at sill one-eighth of the width in from each end of the glass, but not less than 6 inches, unless otherwise recommended by the glass manufacturer.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide edge blocking at edges of glass walls to prevent glass lites from moving sideways in glazing channel, sized and located to comply with the glass manufacturers recommendations and the requirements in referenced glazing publications.
   1. Edge blocking will not be required at structural glazed window walls, except at edges where window walls abut other construction, unless specifically required by the glass manufacturer for the conditions shown.

H. Set glass lites with uniform pattern, draw, bow, and similar characteristics, producing the greatest possible degree of uniformity in appearance on the entire exterior wall elevation.
   1. Set glass units with void between edge of units and glazing channel.
   2. Orient and install insulating glass units made up with one light of low emissivity coated glass with the uncoated glass light on the inboard (building) side.

3.4 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way and from any source, including natural causes, accidents, and vandalism.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.5 GLASS SCHEDULE – EXTERIOR GLAZING

A. Vision Glass Units – Insulated Units:
1. Glass Type 1 (GL-01): 1” insulating unit.
a. Basis-of-Design Product and Manufacturer: PPG Solarban 70XL;
b. Type FT (fully tempered).
c. Unit Makeup:
1) Outboard Lite: Class 1 (clear), 1/4” thick minimum glass lite, with low emissivity coating located on the #2 surface.
2) Space: 1/2”; air filled.
3) Inboard Lite: Class 1 (Starphire), 1/4” thick minimum glass lite.
d. Performance Criteria: 66 % minimum.
1) U-value (summer): 0.26.
2) U-value (winter): 0.28.
3) Solar Heat Gain (SHGC): 0.28 maximum.
4) Shading Coefficient (SC): 0.32

END OF SECTION 08 8000
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SECTION 08 83 00 – MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes mirrored glass with vinyl-backing safety film.

1.2 ACTION SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

C. Samples: As follows:

1. Mirrored Glass: 12 inches (300 mm) square, including safety backing and edge treatment on 2 adjoining edges.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product certificates.

C. Preconstruction Test Report: For mirror mastic compatibility.

D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

B. Glazing Publications: Comply with published recommendations in GANA's "Glazing Manual," unless more stringent requirements are indicated.

C. NAAMM's Publication: For silvered mirrored glass, comply with recommendations in NAAMM's "Mirrors, Handle with Extreme Care, Tips for the Professional on the Care and Handling of Mirrors."

D. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201.

E. Preconstruction Compatibility Test: Submit mirror mastic products to organic protective coating manufacturer for testing to determine compatibility of adhesive with mirrored glass coating.

1.5 DELIVERY, STORAGE, AND HANDLING

A. For silvered mirrored glass, comply with mirrored glass manufacturer's written instructions for shipping, storing, and handling mirrored glass as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrored glass units that deteriorate f.o.b. the nearest shipping point to Project site, within five years from date of Substantial Completion.

1. Deterioration of Silvered Mirrored Glass: Defects developed from normal use not caused by maintaining and cleaning mirrored glass contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 FLOAT GLASS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent glass, flat).

1. Clear: Class 1 (clear), Quality q2 (mirror).

a. Thickness: 6 mm.

2.3 MIRRORED GLASS

A. Silvered Mirrored Glass:

1. Manufacturers:

a. American Mirror Company, Inc.
b. Carolina Mirror Company.
c. Donisi Mirror Company.
d. Gardner Glass Products.
e. Gilded Mirrors, Inc.
f. Lenoir Mirror Company.
g. Stroupe Mirror Co., Inc.
h. Sunshine Mirror.
i. Virginia Mirror Co., Inc.
j. VVP America, Inc.; Binswanger Mirror Products.
k. Walker Glass Co., Ltd.

2. Annealed Float Glass: Clear.
3. Silvering: Successive layers of chemically deposited silver, electrically or chemically deposited copper, and manufacturer's standard organic protective coating applied to second glass surface to produce coating system complying with FS DD-M-411.

B. Fabrication:

1. Cutouts: Fabricate cutouts for notches and holes in mirrored glass without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrored glass.
2. Mirrored Glass Edge Treatment: Rounded polished.

a. Silvered Mirror Glass: Seal edges after edge treatment to prevent chemical or atmospheric penetration of glass coating.
b. Factory Fabricate: Perform edge treatment and sealing in factory immediately after cutting to final sizes.

C. Vinyl-Backed Safety Mirrored Glass: Apply vinyl backing with pressure-sensitive adhesive coating over glass coating as recommended by vinyl-backing manufacturer to produce a surface free of bubbles, blisters, and other imperfections. Use adhesives and vinyl backing compatible with mirrored glass as certified by organic coating manufacturer.

2.4 MISCELLANEOUS MATERIALS

A. Setting Blocks: Neoprene, 70 to 90 Shore A hardness.

B. Edge Sealer: Coating compatible with glass coating and approved by mirrored glass manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrored glass by spot application and not containing asbestos.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Qwikset Mirror Mastic by Palmer Products Corporation.
b. UltraBond by Gunther Mirror Mastics.

D. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

1. VOC Content: Not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.

B. Install mirrored glass units to comply with written instructions of mirrored glass manufacturer and with referenced GANA and NAAMM publications. Mount mirrored glass accurately in place in a manner that avoids distorting reflected images.

C. Provide space for air circulation between back of mirrored glass units and face of mounting surface.

D. Mastic Spot Installation System:

1. Apply barrier coat to mirrored glass backing where approved in writing by manufacturers of mirrored glass and backing material.
2. Apply mastic in spots to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrored glass units and face of mounting surface.
3. After mastic is applied, align mirrored glass units and press into place while maintaining a minimum air space of 1/8 inch (3 mm) between back of mirrored glass and mounting surface.

E. Protect mirrored glass from breakage and contaminating substances resulting from construction operations.

1. Do not permit edges of silvered mirrored glass to be exposed to standing water.
2. Maintain environmental conditions that will prevent silvered mirrored glass from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION 08 83 00
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SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

B. Related Sections include the following:

1. Division 05 Section "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.
2. Division 07 Section "Thermal Insulation" for insulation installed with Z-shaped furring members.
3. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall joint systems installed with non-load-bearing steel framing.
4. Division 09 Section "Portland Cement Plastering" for metal lath supported by non-load-bearing steel framing.
5. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for non-load-bearing metal shaft-wall framing, gypsum panels, and other components of shaft-wall assemblies.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 , hot-dip galvanized, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

a. Type: Postinstalled, expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
2. Steel Studs: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0179 inch.
b. Depth: As indicated on Drawings.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

    a. Minimum Base Metal Thickness: 0.0179 inch.

4. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.

    a. Configuration: Asymmetrical or hat shaped.

F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Armstrong World Industries, Inc.; Drywall Grid Systems.
    b. Chicago Metallic Corporation; 640-C Drywall Furring System.
    c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0312 inch.
2. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

    a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

        1) Steel Network Inc. (The); VertiClip SLD Series.
        2) Superior Metal Trim; Superior Flex Track System (SFT).

C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
    b. Metal-Lite, Inc.; The System.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0329 inch.

E. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0179 inch.
2. Depth: As indicated on Drawings.

G. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

H. Cold-Rolled Furring Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch.
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch- diameter wire.

I. Z-Shaped Furring: With slotted or nonslotted web, face flange of not less than 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.030 inch, and depth required to fit insulation thickness indicated.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:
1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:

a. Single-Layer Application: 24 inches o.c., unless otherwise indicated.
b. Multilayer Application: 16 inches o.c., unless otherwise indicated.
c. Tile backing panels: 16 inches o.c., unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb, unless otherwise indicated.
b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

D. Direct Furring:

1. Screw to wood framing.

2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Z-Furring Members:

1. Erect insulation (specified in Division 07 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.
3. Accessories necessary for a complete installation.

B. Related Requirements:
1. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
2. Division 09 painting Sections for primers applied to gypsum board surfaces.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.3 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40% percent.

B. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

C. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site.

D. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CertainTeed Corp.
2. Georgia-Pacific Gypsum LLC.
3. Lafarge North America Inc.
4. National Gypsum Company.
5. USG Corporation.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

C. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Thickness: 1/4 inch (6.4 mm).
2. Long Edges: Tapered.

D. Gypsum Ceiling Board: ASTM C 1396/C 1396M. Manufactured to have more sag resistance than standard regular type gypsum board of same thickness.

1. Thickness: 1/2 inch (12.7 mm).
2. Long Edges: Tapered.

E. Foil-Backed Gypsum Board: ASTM C 1396/C 1396M.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.

F. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10.

2.4 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. CertainTeed Corp.; GlasRoc Tile Backer.
   b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.

2. Core: 5/8 inch (15.9 mm), Type X.
3. Mold Resistance: ASTM D 3273, score of 10.

B. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. CertainTeed Corp.
   b. Georgia-Pacific Gypsum LLC.
   c. Lafarge North America Inc.
   d. USG Corporation.

2. Core: 5/8 inch (15.9 mm), Type X.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

    a. Cornerbead.
    b. Bullnose bead.
    c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    d. L-Bead: L-shaped; exposed long flange receives joint compound.
    e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    f. Expansion (control) joint.
    g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Fry Reglet Corp.
    b. Gordon, Inc.
    c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Cementitious Backer Units: As recommended by backer unit manufacturer.
3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40 % percent.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Pecora Corporation; AC-20 FTR.
   b. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
   c. USG Corporation; SHEETROCK Acoustical Sealant.
2. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

G. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: Vertical surfaces unless otherwise indicated.
2. Type X: Where required for fire-resistance-rated assembly Vertical surfaces unless otherwise indicated.
3. Type C: Where required for specific fire-resistance-rated assembly indicated.
4. Flexible Type: Apply in double layer at curved assemblies.
5. Ceiling Type: Ceiling surfaces.
6. Foil-Backed Type: As indicated on Drawings.
7. Moisture- and Mold-Resistant Type: As indicated on Drawings and in wet room where tile is not specified.
8. Glass-Mat Interior Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- (300-mm-) long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c.

3.4 APPLYING TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

B. Water-Resistant Backing Board: Install where indicated with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. Bullnose Bead: Use where indicated.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use where indicated.
6. Curved-Edge Cornerbead: Use at curved openings.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 3: Where indicated on Drawings.
4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in other Division 09 Sections.

5. Level 5: Where indicated on Drawings.

    a. Primer and its application to surfaces are specified in other Division 09 Sections.

E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 00 – TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceramic floor tile.
2. Glazed wall tile.
3. Glass wall tile.
4. Special-purpose tile.
5. Waterproof membrane for thin-set tile installations.
6. Crack-suppression membrane for thin-set tile installations.
7. Joint sealants installed as part of tile installations.
8. Metal edge strips installed as part of tile installations.

B. Related Sections:

1. Division 09 Section "Gypsum Board" for tile backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints.

C. Samples:

1. Each type, composition, color, and finish of tile.
2. Assembled samples with grouted joints for each color grout and for each type, composition, color, and finish of tile.
3. For each color of joint sealant.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Basis-of-Design Product: The design for each tile type is based on the product named. Subject to compliance with requirements, provide the named product. See Finish Schedule on the Drawings.

2.2 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.
2. Step Treads: Minimum 0.6.
3. Ramp Surfaces: Minimum 0.8.

2.3 TILE PRODUCTS

A. Low-Emitting Materials: Tile flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

C. Floor Tile: Flat tile as follows:

1. Basis-of-design Product: As indicated in schedule on Drawings.

D. Wall Tile: Flat tile as follows:
1. Basis-of-Design Product: As indicated in schedule on Drawings.

E. Wall Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing where applicable.

2.4 ACCESSORY MATERIALS

A. Thresholds: Fabricate to provide transition between adjacent floor finishes.
1. Edge protection and Transition: Basis of Design- Scluter Reno-U.

B. Wainscot Cap:
1. Finish edging where tile does not extent floor to ceiling: basis of design-Schluter Schiene.

2.5 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS

A. Waterproofing and Crack-Suppression Membranes for Thin-Set Tile Installations: Manufacturer's standard product that complies with ANSI A118.10, selected from the following.

1. Chlorinated-Polyethylene-Sheet Product: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric, 0.030 inch (0.76 mm) nominal thickness.

a. Product: Noble Company (The); Nobleseal CIS.
b. Product: Noble Company (The); Nobleseal TS.

2. Polyethylene-Sheet Product: Polyethylene faced on both sides with fleece webbing, 0.008 inch (0.203 mm) nominal thickness.

a. Product: Schluter Systems L.P.; KERDI.

B. Urethane Waterproofing and Tile-Setting Adhesive: One-part, liquid-applied urethane, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24),, that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," in a consistency suitable for trowel application and intended for use as both waterproofing and tile-setting adhesive in a two-step process.

2.6 SETTING AND GROUTING MATERIALS

A. Manufacturers:

1. Custom Building Products.
2. LATICRETE International Inc.
3. MAPEI Corporation.

B. Source Limitations: For each tile installation, obtain compatible formulations of setting and grouting materials containing latex or latex additives from a single manufacturer.

C. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.1A.

D. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Prepackaged dry-mortar mix combined with liquid-latex additive.

    a. MAPEI, Keralastic System; consisting of Kerabond dry-set mortar and Keralastic Latex admixture. For Rapid Setting requirements; MAPEI, Granirapid System; consisting of Granirapid liquid and Granirapid powder.

2. For wall applications, provide nonsagging mortar.

E. Medium-Bed, Latex-Portland Cement Mortar: ANSI A118.4:

1. Prepackaged dry-mortar mix combined with liquid-latex additive.
2. Prepackaged dry-mortar mix containing polymer additive to which only water must be added at Project site.
3. For wall applications, provide nonsagging mortar.

    a. MAPEI, Ultraflex LFT

F. Polymer-Modified Tile Grout: ANSI A118.7.

1. Polymer Type: Dry, redispersible form, prepackaged with other dry ingredients.
2. Colors: As selected from manufacturer's full range.

G. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)., that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

H. Organic Adhesive: ANSI A 136.1,Type I, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)., that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 MISCELLANEOUS MATERIALS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 07 Section "Joint Sealants."

1. VOC Content: Not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
3. One-Part, Mildew-Resistant Silicone: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for in-service exposures of high humidity and extreme temperatures.

a. Products:

1) Dow Corning Corporation; Dow Corning 786.
2) GE Silicones; Sanitary 1700.
3) Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
4) Tremco, Inc.; Tremsil 600 White.

4. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

a. Products:

1) Pecora Corporation; NR-200 Urexpan.
2) Tremco, Inc.; THC-900.

b. Color: selected from manufacturer's standard colors..

B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials.

C. Metal Edge Strips: Angle or L-shape, nickel silver exposed-edge material.

D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.

C. Remove protrusions, bumps, and ridges by sanding or grinding.

D. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

E. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.2 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCNA Installation Guidelines: TCNA's "Handbook for Ceramic Tile Installation." Comply with TCNA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Movement Joints: Locate movement joints and other sealant-filled joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Grout tile to comply with requirements of ANSI A108.10, unless otherwise indicated.

1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

I. Install crack isolation membrane to comply with ANSI A118.10 and membrane manufacturer's written instructions for full floor coverage.

J. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

1. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

K. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.

1. Tile floors in wet areas.

L. Install tile on floors with the following joint widths:

1. As noted on the Drawings or minimum requirement by tile manufacturer.

M. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

N. Install tile on walls with the following joint widths:

1. As noted on the drawings or minimum requirement by tile manufacturer.

O. Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.3 FLOOR TILE INSTALLATION SCHEDULE

A. Interior floor installation on concrete; thin-set mortar; TCNA F113.

1. Thin-Set Mortar: Latex-portland cement mortar.
2. Grout: Polymer-modified sanded or Polymer-modified unsanded grout depending on conditions.

B. Interior floor installation on waterproof or crack-suppression membrane over concrete; thin-set mortar; TCNA F122.

1. Thin-Set Mortar: Latex-portland cement mortar.
2. Grout: Polymer-modified unsanded grout.

3.4 WALL TILE INSTALLATION SCHEDULE

A. Interior wall installation; thin-set mortar; over gypsum board; TCNA W243 or cementitious backer units; TCNA W244.

1. Thin-Set Mortar: Dry-set or Latex- portland cement mortar.
2. Grout: Polymer-modified sanded or Polymer-modified unsanded grout depending on conditions.

END OF SECTION 09 30 00
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SECTION 09 51 23 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical tiles for ceilings.
2. Concealed suspension systems.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Tile: Set of full-size Samples of each type, color, pattern, and texture.
2. Concealed Suspension-System Members: 6-inch- (150-mm-) long Sample of each type.
3. Exposed Moldings and Trim: Set of 6-inch- (150-mm-) long Samples of each type and color.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Method of attaching hangers to building structure.
    a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical tile ceiling, for tests performed by a qualified testing agency.

D. Evaluation Reports: For each acoustical tile ceiling suspension system and anchor and fastener type, from ICC-ES.

E. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size tiles equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to 2 percent of quantity installed.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to the National Voluntary Laboratory Accreditation Program (NVLAP) for testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 or local Code whichever is greater.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 450 or less.

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL TILES, GENERAL

A. Low-Emitting Materials: Acoustical tile ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Source Limitations:

1. Acoustical Ceiling Tile: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

C. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system from single source from single manufacturer.

D. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.

E. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL TILES ACT 1

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Armstrong World Industries, Inc.

B. Edge/Joint Detail: match specified suspension system.

C. Thickness: 3/4 inch (19 mm).

D. Modular Size: As indicated on Drawings.

E. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Metal Suspension-System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

a. Type: Postinstalled expansion anchors.
b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without

failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- (3.5-mm-) diameter wire.

E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate lateral forces.

F. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical tiles in-place.

2.5 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Armstrong World Industries, Inc.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Armstrong World Industries, Inc.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical tile edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.7 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, provide one of the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. USG Corporation; SHEETROCK Acoustical Sealant.

B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
3. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Arrange directionally patterned acoustical tiles as follows:

1. As indicated on reflected ceiling plans.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.

1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches (305 mm) o.c.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Compliance of seismic design.

B. Prepare test and inspection reports.

3.5 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 23

SECTION 09 65 13 – RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall base.
2. Molding accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each product indicated.

B. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

1.3 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 COLORS AND PATTERNS

A. Colors and Patterns: As selected from manufacturer's full range.

2.3 RESILIENT WALL BASE B-1, B-3 and B-4.

A. Wall Base: ASTM F 1861, subject to compliance with requirements, provide products by one of the following:

1. AFCO-USA, American Floor Products Company, Inc.
2. Armstrong World Industries, Inc.
3. Azrock Commercial Flooring, DOMCO.
4. Johnsonite.
5. Roppe Corporation.

B. Type (Material Requirement): TV (vinyl).

C. Style: Cove (with top-set toe) at resilient and hard floor surfaces; Straight (toeless) at carpet if not noted otherwise on the drawings.

D. Minimum Thickness: 0.125 inch (3.2 mm).

E. Height: 4 inches (102 mm) infnot note otherwise on the drawings.

F. Lengths: Coils in manufacturer's standard length.

G. Outside Corners: Job formed

H. Inside Corners: Job formed.

I. Surface: Smooth.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. VOC Content: Comply with the following limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

   a. Cove Base Adhesives: Not more than 50 g/L.
   b. Rubber Floor Adhesives: Not more than 60 g/L.

2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

C. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

D. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.3 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

    a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

END OF SECTION 09 65 13
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SECTION 09 65 19 – RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Vinyl composition tile (VCT).

1.2 ACTION SUBMITTALS

A. Product Data: For each product indicated.

B. Samples: Full-size units of each color and pattern of resilient floor tile required.

1.3 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:

   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 VINYL COMPOSITION TILE -VCT 1

A. Vinyl Composition Tile (VCT): ASTM F 1066.

1. Products: Subject to compliance with requirements, provide the following:
   a. Armstrong World Industries, Inc.; As indicated on the Drawings.

B. Color and Pattern: As indicated on the drawings.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch (3.2 mm).

E. Size: 12 by 12 inches (305 by 305 mm).

F. Fire-Test-Response Characteristics:

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

   a. VCT and Asphalt Tile Adhesives: Not more than 50 g/L.

2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture Testing:

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lbs. of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are same temperature as space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in pattern of colors and sizes indicated.

C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

D. Extend tiles into toe spaces, door reveals, closets, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

H. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

    a. Do not wash surfaces until after time period recommended by manufacturer.

I. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

END OF SECTION 09 65 19
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SECTION 09 68 13 – TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes carpet tile and installation.

1.2 ACTION SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include the following:

1. Existing floor materials to be removed.
2. Existing floor materials to remain.
3. Pattern of installation.
4. Pattern type, location, and direction.
5. Pile direction.
6. Insets and borders.
7. Transition and other accessory strips.
8. Transition details to other flooring materials.

C. Samples: For each for each carpet tile and exposed accessory and for each color and pattern required.

D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Warranty: Special warranty specified in this Section.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Mockups: Install mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Install mockups as shown on Drawings.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

1.7 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

B. Environmental Limitations: Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet tile over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tile, install carpet tile before installing these items.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace carpet tile that does not comply with requirements or that fails within 10 years from date of Substantial Completion.

1. Warranty does not include deterioration or failure of carpet tile from unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

PART 2 - PRODUCTS

2.1 CARPET TILE **,** CPT-1 and CPT-2

A. Performance Characteristics: As follows:

1. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program.
2. Emissions: Provide carpet tile that complies with the product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Products: Subject to compliance with requirements, provide one of the following:

1. Manufacturers: products as indicated on the Drawings.

a. Color and Pattern: As indicated on the Drawings.

C. Critical Radiant Flux Classification: Class I, not less than 0.45 w/sq. cm per ASTM E 648.

2.2 ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and that is recommended by carpet tile manufacturer.

1. VOC Content: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with CRI 104, Section 13, "Carpet Modules (Tiles)."

B. Install borders parallel to walls.

END OF SECTION 09 68 13

SECTION 09 91 27 – PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and field painting of exposed interior and exterior items and surfaces.

B. Paint exposed surfaces. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1.2 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.3 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.

B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

C. Qualification Data: For Applicator.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5.

1. Wall Surfaces: Provide samples on at least 100 sq. ft.
2. Small Areas and Items: Architect will designate items or areas required.
3. Final approval of colors will be from benchmark samples.

1.5 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F, and are projected to be within the same range for not less than 48 hours following application.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F, and are projected to be within the same range for not less than 48 hours following application.

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.6 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: 5 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Benjamin Moore & Co. (Benjamin Moore).
2. ICI Dulux Paint Centers (ICI Dulux Paints).
3. M. A. Bruder & Sons, Inc. (M. A. B. Paint).
4. PPG Industries, Inc. (Pittsburgh Paints).
5. Sherwin-Williams Co. (Sherwin-Williams).

2.2 PAINT, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) or requirements of local Code authority which ever is more restrictive; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC content not more than 100 g/L.
4. Floor Coatings: VOC content not more than 50 g/L.
5. Shellacs, Clear: VOC content not more than 730 g/L.
6. Shellacs, Pigmented: VOC content not more than 550 g/L.
7. Dry-Fog Coatings: VOC content of not more than 150 g/L.
8. Traffic Coatings: VOC content of not more than 100 g/L.
9. Waterproofing Concrete Coatings: VOC content of not more than 100 g/L.

D. Colors: Provide custom colors of the finished paint systems to match the Architect’s samples.

2.3 PREPARATORY COATS

A. Concrete Unit Masonry Block Filler: High-performance latex block filler of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

B. Interior Primer: Interior primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

1. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.
2. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
3. Ferrous-Metal Substrates: Quick drying, rust-inhibitive metal primer. Rust converter at tight rust areas.

4. Zinc-Coated Metal Substrates: Galvanized metal primer.
5. Concrete Shop Floor – shop blast floor prior to painting. SW Armor seal 33 or Benjamin Moore P41 .
6. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

C. Exterior Primer: Exterior primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

1. Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex primer for exterior application.
2. Ferrous-Metal and Aluminum Substrates: Rust-inhibitive DTM metal primer. At rust spots, remove all rust spots or convert rust spots at tight rust areas.
3. Zinc-Coated Metal Substrates: Galvanized metal primer.
4. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.
5. Primer for Waterproofing Coating: Alkali-resistant primer recommended by finish coat manufacturer for application over substrate indicated.

D. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint system indicated.

2.4 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application.

1. Benjamin Moore; Regal Wall Satin No. 215 Premium Interior Finishes Flat Finish: Applied at a dry film thickness of not less than 1.3 mils.
2. Sherwin-Williams; SuperPaint Interior Latex Flat Wall Paint, A86 Series: Applied at a dry film thickness of not less than 1.5 mils.

B. Interior Flat Latex-Emulsion Size: Factory-formulated flat latex-based interior paint.

1. Benjamin Moore; Colorscapes Interior Latex Flat No. 515: Applied at a dry film thickness of not less than 1.4 mils.
2. Sherwin-Williams; SuperPaint Flat Wall Paint A86 Series: Applied at a dry film thickness of not less than 1.5 mils.

C. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.

1. Benjamin Moore; Moore's Regal AquaVelvet No. 319: Applied at a dry film thickness of not less than 1.4 mils.
2. Sherwin-Williams; SuperPaint Interior Latex Satin Wall Paint A87 Series: Applied at a dry film thickness of not less than 1.6 mils.

D. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.

2.5 INTERIOR FLOOR PAINT

A. Epoxy Floor Paint: Factory-formulated epoxy floor paint for interior application.

1. Benjamin Moore; P40, 100% solid with p67 aggregate – hand broadcast, hand rolled.

2. Sherwin-Williams; Armour seal 650 SL-RC with aggregate – hand broadcast, hand rolled.

2.6 EXTERIOR FINISH COATS

A. Exterior Semigloss Acrylic Enamel: Factory-formulated semigloss waterborne acrylic-latex enamel for exterior application.

1. Benjamin Moore; refer to drawings: Applied at a dry film thickness of not less than 1.2 mils.
2. Sherwin-Williams; SuperPaint Exterior Gloss Latex A-84 Series: Applied at a dry film thickness of not less than 1.4 mils.

B. Exterior Full-Gloss Acrylic Enamel for Ferrous and Other Metals:

1. Benjamin Moore: P06 primer with PTM P24 top coat
2. Sherwin-Williams: SW Bondplex acrylic coating

2.7 EXTERIOR STOREFRONT PAINTING

A. Oil Painting finish system: 2 part system.
1. Crescent Bronze (Sherwin Williams subsidiary): Medium oil alkyd primer, Medium oil alum colored (TBD) oil paint, UV clear coat medium oil (contact Paul Sobroski 1-800-445-6810)

2.8 TRAFFIC PAINT

A. Traffic paint:

1. M. A. B. Paint; Zone Marking Traffic Paint (183001 white, 183002 white).
2. Sherwin Williams; Set Fast Premium Traffic Marking Paint (white A300, yellow A303).
3. Duron: Dura Clad Alkyd Zone Marking Paint 993-8000 white, or 993-8001 yellow.

2.9 WATERPROOFING COATING

A. High-Build, Water- and Wind-Resistant Coating:

1. BASF (Thoro): Thoro 20.
2. M.A.B. Paint: Modac F.
3. Pittsburgh Paints: Perma-Crete (4-22).

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with procedures specified in PDCA P4.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

C. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

D. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

E. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood.
c. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, and other foreign substances in accordance with SSPC SP 1 “Solvent Cleaning”. After solvent cleaning prepare any bare metal surfaces by removing all stratified rust (rust scale), all loose mill scale, all loose or non-adherent rust and detrimental welding deposits by methods specified in SSPC SP-3 "Power Tool Cleaning".

   a. Touch up bare areas, heads of bolts, welded surfaces which are unpainted, and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
   b. Surfaces requiring touch up painting shall be cleaned and primed as soon as practicable after erection and before excessive rusting or other damage occurs to such surfaces from weather or other exposure.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
6. Gypsum Wallboard: Repair all surfaces in gypsum wallboard with wallboard joint finishing compound or spackling compound, filled out flush and sanded smooth. Clean all surfaces and taped joints of dust, dirt and other contaminants and be sure they are thoroughly dry before applying paint.
7. Existing Concrete floor – clean floor. Shop blast per manufacturer’s recommendation prior to painting.

F. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

G. General Application: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors and finishes are indicated in the finish schedule.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Sand lightly between each succeeding enamel or varnish coat.

H. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

I. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

J. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

K. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

L. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Tanks that do not have factory-applied final finishes.

5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
8. Accessory items.

M. Electrical items to be painted include, but are not limited to, the following:

1. Conduit and fittings.
2. Switchgear.
3. Panelboards.
4. Electrical equipment that is indicated to have a factory-primed finish for field painting.

N. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

O. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

P. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

Q. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

R. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.2 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.3 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.4 INTERIOR PAINT SCHEDULE

A. Concrete and Masonry (Other Than Concrete Unit Masonry): Provide the following paint systems over interior concrete and brick masonry substrates:

1. Acrylic Enamel Finish: Two finish coats over a primer.

a. Primer: Interior concrete and masonry primer.
b. Finish Coats: Interior acrylic enamel.

1) Gloss: As indicated in Finish Schedule in Drawings.

2. Alkyd-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior concrete and masonry primer.
b. Finish Coats: Interior alkyd enamel.

1) Gloss: As indicated in Finish Schedule in Drawings.

c. Location: For use in interior service areas and other locations where exposed to vehicles and other sources of abuse.

B. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:

1. Acrylic Enamel Finish: Two finish coats over block filler.

a. Block Filler: Concrete unit masonry block filler.
b. Finish Coats: Interior acrylic enamel.

1) Gloss: As indicated in Finish Schedule in Drawings.

2. Alkyd-Enamel Finish: Two finish coats over a primer.

a. Primer: Concrete unit masonry block filler.
b. Finish Coats: Interior alkyd enamel.

1) Gloss: As indicated in Finish Schedule in Drawings.

c. Location: For use in interior service areas and other locations where exposed to vehicles and other sources of abuse.

C. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Acrylic Enamel Finish: Two finish coats over a primer.

a. Primer: Interior gypsum board primer.

b. Finish Coats: Interior acrylic enamel.

1) Gloss: As indicated in Finish Schedule in Drawings.

D. Wood and Hardboard: Provide the following paint finish systems over new interior wood surfaces:

1. Alkyd-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior wood primer for acrylic-enamel and alkyd-enamel finishes.
b. Finish Coats: Interior alkyd enamel.

1) Gloss: As indicated in Finish Schedule in Drawings.

E. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Acrylic Finish: Two finish coats over a rust-inhibitive primer.

a. Primer: Interior rust-inhibitive ferrous-metal primer.
b. Finish Coats: Interior acrylic paint.

1) Gloss: As indicated in Finish Schedule in Drawings.

2. Alkyd-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior rust-inhibitive ferrous-metal primer.
b. Finish Coats: Interior alkyd enamel.

1) Gloss: As indicated in Finish Schedule in Drawings.

c. Location: For use in interior service areas and other locations where exposed to vehicles and other sources of abuse.

F. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:

1. Acrylic Finish: Two finish coats over a primer.

a. Primer: Interior zinc-coated metal primer.
b. Finish Coats: Interior acrylic enamel.

1) Gloss: As indicated in Finish Schedule in Drawings.

2. Alkyd-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior zinc-coated metal primer.
b. Finish Coats: Interior alkyd enamel.

1) Gloss: As indicated in Finish Schedule in Drawings.

c. Location: For use in interior service areas and other locations where exposed to vehicles and other sources of abuse.

3.5 EXTERIOR PAINT SCHEDULE

A. Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry): Provide the following finish systems over exterior concrete, stucco, and brick masonry substrates:

1. Latex Finish: Two finish coats over a primer.

a. Primer: Alkali-resistant primer.
b. Finish Coats: Exterior acrylic latex.

2. Gloss: As indicated in Finish Schedule in Drawings.

B. Concrete Unit Masonry: Provide the following finish systems over exterior concrete unit masonry:

1. Acrylic Latex Finish: Two finish coats over block filler.

a. Block Filler: Exterior concrete unit masonry block filler.
b. Finish Coats: Exterior acrylic latex.

2. Gloss: As indicated in Finish Schedule in Drawings.

C. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

1. Acrylic Finish: Two finish coats over a rust-inhibitive primer.

a. Primer: Exterior ferrous-metal primer.
b. Finish Coats: Exterior acrylic-latex.

2. Gloss: As indicated in Finish Schedule in Drawings. Provide full gloss finish coats on exterior bollards.

D. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:

1. Acrylic Finish: Two finish coats over a galvanized metal primer.

a. Primer: Exterior galvanized metal primer.
b. Finish Coats: Exterior acrylic paint.

2. Gloss: As indicated in Finish Schedule in Drawings.

E. Waterproofing Coating: Provide the following coating over exposed concrete and concrete masonry; applied to form dry film thickness of not less than 10 mils:

1. High-Build Latex Finish: Two finish coats over an alkali-resistant primer.

a. Primer: Exterior alkali-resistant primer.
b. Finish Coats: Exterior acrylic high-build coating.

2. Locations: As indicated in Drawings and as directed by Architect.

END OF SECTION 09 91 27

SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and application of high-performance coating systems on the following substrates:

1. Exterior Substrates:
   a. Steel – Shop painted with field painting at joints.

B. Related Requirements:

1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
2. Division 09 painting Sections for special-use coatings and general field painting.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each coating system specified in Part 3.
   a. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

   a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 WARRANTY

A. Special Warranty: Provide manufacturer's standard 15 year color, gloss, and corrosion flouropolymer warranty.

1.7 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product: The design for paint system noted is based on the product named. Provide products by the following:
   1. Tnemec Company, Inc.

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2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."

B. Material Compatibility:

   1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
   3. Provide products of same manufacturer for each coat in a coating system.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior coatings applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   1. Nonflat Paints and Coatings: 150 g/L.
   2. Primers, Sealers, and Undercoaters: 200 g/L.
   3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: 250 g/L.
   4. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
   5. Pre-Treatment Wash Primers: 420 g/L.

D. Low-Emitting Materials: Interior coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

C. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
1. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for coating and substrate indicated.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Contractor will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates:

1. High-Build Epoxy System: Shop apply all coats except at the field weld connections which will be field painted.

    a. Prime Coat: Tnemec Series 94-H20 Hydro-Zinc, Dry Film Thickness 2 .5 - 3 .5 mils.
    b. Intermediate Coat: Tnemec Series V 69 Hi-Build Epoxoline II, Dry Film Thickness 2-10 mils.
    c. Topcoat: Tnemec Series V1071 Fluoronar, Simi-gloss, Dry Film Thickness 2-3 mils.

END OF SECTION 09 96 00

SECTION 10 21 13 – TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes toilet compartments and screens as follows:

1. Type: Stainless steel.
2. Compartment Style: Floor anchored.
3. Screen Style: Wall hung.

1.2 ACTION SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include plans, elevations, sections, details of installation, and attachments to other Work.

C. Samples: For each exposed finish and for each color and pattern required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bobrick Washroom Equipment, Inc.
2. Global Steel Products Corp.

2.2 MATERIALS

A. Panel, Pilaster, and Door Material:

1. Stainless-Steel Sheet: ASTM A 666, Type 302 or 304, stretcher-leveled flatness, No. 3 or No. 4 directional polish.

B. Core Material for Metal-Faced Units: Sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch (25 mm) minimum for doors, panels, and screens and 1-1/4 inches (32 mm) minimum for pilasters.

C. Pilaster Shoes and Sleeves (Caps): Stainless steel, not less than 3 inches (75 mm) high.

D. Stirrup Brackets: Stainless steel.

E. Continuous Brackets: Stainless steel.

2.3 FABRICATION

A. Toilet Compartments: Floor anchored.

B. Urinal Screens: Wall hung.

C. Metal Units: Internally reinforce metal panels for hardware, accessories, and grab bars.

D. Doors: Unless otherwise indicated, 24 inch (610 mm) wide in-swinging doors for standard toilet compartments and 36 inch (914 mm) wide out-swinging doors with a minimum 32 inch (813 mm) wide clear opening for compartments indicated to be accessible to people with disabilities.

E. Door Hardware: Stainless steel. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.

1. Hinges: Self-closing type, adjustable to hold door open at any angle up to 90 degrees.
2. Latches and Keepers: Recessed unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
3. Coat Hook: Combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Rubber-tipped bumpers at out-swinging doors or entrance screen doors.
5. Door Pull: Provide at out-swinging doors. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units rigid, straight, level, and plumb, with not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Provide brackets, pilaster shoes, bracing, and other components required for a complete installation. Use theft-resistant exposed fasteners finished to match hardware. Use sex-type bolts for through-bolt applications.

1. Brackets: Align brackets at pilasters with brackets at walls. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
2. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.

END OF SECTION 10 21 13
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SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Childcare accessories.
3. Custodial accessories.

B. Related Sections:

1. Division 08 Section "Mirrors" for frameless mirrors.
2. Division 09 Section "Tiling" for ceramic toilet and bath accessories.
3. Division 10 Section "Detention Toilet Accessories" for accessories designed for installation in detention facilities.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.7 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. American Specialties, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation.

2.3 CHILDCARE ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. American Specialties, Inc.
2. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
3. Koala Kare Products; a division of Bobrick Washroom Equipment, Inc.

2.4 CUSTODIAL ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. American Specialties, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10 28 00

SECTION 10 44 00 – FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable fire extinguishers and fire protection cabinets.

B. Related Sections:

1. Division 07 Section "Penetration Firestopping" for firestopping sealants at fire-rated cabinets.
2. Division 09 Section "Painting" for field-painting fire-protection cabinets.

1.2 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.

1. Fire Extinguishers: Include rating and classification.
2. Cabinets: Include door hardware, cabinet type, trim style, panel style, and details of installation.

B. Samples: For each exposed cabinet finish.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1.4 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 366/A 366M carbon steel, commercial quality, stretcher leveled, temper rolled.

B. Aluminum: ASTM B 209 (ASTM B 209M) sheet and ASTM B 221 (ASTM B 221M) extrusions, alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.

C. Stainless-Steel Sheet: ASTM A 666/A 666M, Type 302 or Type 304 alloy.

D. Copper-Alloy Sheet, Brass: ASTM B 36/B 36M, alloy UNS No. C26000 (cartridge brass, 70 percent copper).

E. Copper-Alloy Sheet, Bronze: ASTM B 36/B 36M, alloy UNS No. C28000 (muntz metal, 60 percent copper).

2.2 PORTABLE FIRE EXTINGUISHERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Fire-End & Croker Corporation.
2. General Fire Extinguisher Corporation.
3. J. L. Industries, Inc.
4. Kidde, Walter The Fire Extinguisher Co.
5. Larsen's Manufacturing Company.
6. Potter-Roemer; Div. of Smith Industries, Inc.
7. Watrous; Div. of American Specialties, Inc.

B. General: Provide fire extinguishers for each cabinet and other locations indicated.

1. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher indicated and with plated or baked-enamel finish.

a. Provide brackets for extinguishers located in cabinets.

2. Identification: Lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as directed by Architect.

C. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 10 lb (4.5 kg) nominal capacity, in enameled-steel container.

2.3 FIRE-PROTECTION CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Fire-End & Croker Corporation.
2. General Accessory Manufacturing Co.
3. J. L. Industries, Inc.
4. Larsen's Manufacturing Company.
5. Potter-Roemer; Div. of Smith Industries, Inc.
6. Watrous; Div. of American Specialties, Inc.

B. Fire Protection Cabinet, FPC-1:

1. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

    a. Fire-Rated Cabinets: Listed and labeled to meet requirements in ASTM E 814 for fire-resistance rating of wall where it is installed.

        1) Construct fire-rated cabinets with double walls fabricated from 0.0478 inch (1.2 mm) thick, cold-rolled steel sheet lined with minimum 5/8 inch (16 mm) thick, fire-barrier material.

    b. Cabinet Metal: Enameled-steel sheet.

2. Cabinet Type: Suitable for fire extinguisher.
3. Cabinet Mounting: Recessed.
4. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
    a. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

        1) Flat Trim for Recessed Cabinets: 1/4 to 5/16 inch (6 to 8 mm) backbend depth.

5. Cabinet Trim Material: Manufacturer's standard steel sheet and same metal and finish as door.
6. Door Material: Manufacturer's standard steel sheet.
7. Door Glazing: Manufacturer's standard, as follows:
    a. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, Class 1 (clear).

8. Door Style: Manufacturer's standard designfully glazed panel with frame.
9. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.

    a. Provide minimum 1/2 inch (13 mm) thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
    b. Provide inside latch.

10. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.
    a. Lettered Door Handle: Provide one-piece, cast-iron door handle with the word "FIRE" embossed into face.

11. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as directed by Architect.

    a. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.

1) Application Process: Silk-screened.
2) Lettering Color: Red.
3) Orientation: Vertical.

2.4 FINISHES

A. Steel Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the following:

1. Exterior of cabinets and doors, except for those surfaces indicated to receive another finish.
2. Interior of cabinets and doors.

B. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

C. Steel, Factory Priming for Field-Painted Finish: Apply manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer shop primer immediately after surface preparation and pretreatment.

D. Steel Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Minimum dry film thickness of 2 mils (0.05 mm).

1. Colorand Gloss: As selected from manufacturer's standard.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine roughing-in for hose valves, hose racks, and cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets are to be installed.

C. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.

D. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
2. Fasten mounting brackets to structure and cabinets, square and plumb.
3. Fasten cabinets to structure, square and plumb.

E. Adjust cabinet doors that do not swing or operate freely.

F. Refinish or replace cabinets and doors damaged during installation.

END OF SECTION 10 44 00
10520/11-99/dub

SECTION 12 48 16 – ENTRANCE FLOOR GRILLES

PART 1 - GENERAL

1.1 **SUMMARY:** This section includes Entrance Floor Grilles (*Stainless Steel Grating*) with stainless steel frames. The Stainless Steel Grating is 5/8" thick. This product is recommended for shallow, level bed recessed applications for new construction or major renovation.

1.2 1.02 REFERENCES

A. A. American Society for Testing and Materials (ASTM)

1. ASTM A276 Standard Specification for Stainless Steel Bars and Shapes

2. ASTM A240 / A240M Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

3. ASTM B221 – Standard Specification for Aluminum and Aluminum Alloy Extrudes Bars, Rods, Wire, Shapes and Tubes.

4. ASTM A193 Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

B. National Association of Architectural Metals Manufacturers (NAAMM)

1. NAAMM AMP-500 Metals Finishes Manual for Architectural and Metal Products

2. ANSI/NAAMM A202.1 (MBG-531) Metal Bar Grating Manual

C. U.S. Architectural & Transportation Barriers Compliance Board's Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)

D. American Concrete Institute (ACI) ACI 302 Guide for Concrete Floor and Slab Construction

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of recess in concrete as required receiving floor Entrance Floor Grilles and frames.

B. Defer frame installation until building enclosure is complete and related interior work is in progress.

1.4 1.04 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for Entrance Floor Grilles and frames.

B. Shop Drawings: Show the following:

1. Items penetrating Entrance Floor Grilles and frames.

2. Divisions between Entrance Floor Grille sections.

3. Perimeter frames

4. Show layout and types of Entrance Floor Grilles and frames, details of patterns, anchors and accessories, and field measurements of slab recess to receive Entrance Floor Grilles and frames (if applicable)

C. Samples: For each type of product indicated, not less than 6 inch square sections of Entrance Floor Grille and 6 inch length of frame material

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Submit Manufacturers maintenance instructions for Entrance Floor Grilles and frames, to be included in maintenance manuals.

B. Warranty Documentation: Submit Manufacturer's limited warranty that products are free from defects in material and workmanship and shall perform as specified for a period of not less than 5 years when installed and maintained in accordance with the manufacturer's instructions.

1.6 QUALITY ASSURANCE: Obtain Entrance Floor Grilles and frames from a single manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver Materials to the project site ready for use and fabricated in as large of sections and assemblies as practical, in unopened original factory packaging clearly labeled to identify the Manufacturer.

B. Store Materials in original factory packaging, under cover in dry, well-ventilated spaces.

1.8 SITE CONDITIONS

A. Field Measurements*:* Installer shall check actual openings for Entrance Floor Grilles and frames by accurate field measurements prior to fabrication. Record field measurements on final shop drawings.

B. Coordinate frame installation with concrete construction to ensure recess and frame anchorage are accurate and that the base is level and flat.

C. Defer installation of Entrance Floor Grilles until the time of substantial completion of the project.

1.9 WARRANTY**:** Entrance Floor Grilles and frames shall be fabricated free of defects in materials and workmanship, and the manufacturer shall offer a 5 year warranty against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturer: Provide products by Kadee Industries, Inc., Walton Hills, OH 44146 Phone: 800-321-3827 Fax: 440-439-6889; email: sales@kadeeindustries.com

B. Basis of Design: Kadee Industries SSS Clean Tread™ Model KD58

2.2 DESCRIPTION

A. Accessibility requirements: Provide and install Entrance Floor Grilles and frames compliant with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)

B. Sustainability Characteristics: Provide Entrance Floor Grilles manufactured from stainless steel comprised of no less than 80% post consumer recycled content and 15% pre-consumer recycled content.

2.3 PERFORMANCE REQUIREMENTS**:** Provide Entrance Floor Grilles and frames capable of withstanding a uniform floor load of 500 lbf/sq. ft.

2.4 MATERIALS

A. Provide colors, patterns and profiles of materials, including metals and metal finishes indicated or specified.

B. Furnish and install SSS Clean Tread™ Model KD58 Entrance Floor Grilles and Frames as manufactured by Kadee Industries, Walton Hills, OH. Grille thickness shall be 5/8"

1. Tread Material shall be manufactured from Type 304 stainless steel .071" x .177" surface wires spaced with a .125" slot opening and resistance welded to .070 x.5" Type 304 stainless steel support rods spaced 1" on center.

2. Hidden Lockdowns*:* Entrance Floor Grilles shall include hidden locking devices manufactured from formed Type 304 stainless steel saddle clip slotted to receive a spring clip and an ASTM A193 Grade B8 18-8 stainless steel machine screw. Hidden Lockdowns shall be spaced no greater than 2'0" on center.

3. Visual Lockdowns : Entrance Floor Grilles shall include visual locking devices manufactured from sintered stainless steel blocks machined to receive an ASTM A193

Grade B8 18-8 stainless steel machine screw. Visual Lockdowns shall be spaced no greater than 2'6" on center.

4. Level Bed Frames: Support rods must rest directly on the recessed floor.
   a. Provide welded frames fabricated from ¾" x ¾" x 1/8" thick Type 304 stainless steel angle with 1" x 1/8" intermediate members and splice plates as required, complete with grouting strap anchors for a permanent recessed application.

5. Pit Liners [optional, select from options as listed]:
   a. Provide .053" thick [16 gage] Type 304 stainless steel pit liners as shown on the approved shop drawings. *[2" drain, pipe, stainless steel strainer, and drain trap shall be furnished under the plumbing contract.]*

2.5 ASSEMBLY

A. Shop Fabrication:
   1. Shop Fabricate Entrance Floor Grilles and frames to the greatest extent possible in the sizes as indicated. Unless otherwise indicated, provide each grille as a single unit. Do not exceed the manufacturer's recommended size and layout for units that are removed for maintenance and cleaning.
   2. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide pieces with hairline joints spliced together.

B. Fabricate Entrance Floor Grilles and frames in accordance with the final shop drawings. Manufacturing tolerances shall be in accordance with ANSI/NAAMM A202.1 (MBG-531) Metal Bar Grating Manual.

2.6 FINISHES

A. Comply with NAAMM'S "Metals Finishes Manual for Architectural and Metal Products".

B. Tread Material: Stainless Steel: Polished Finish No 4

C. Stainless Steel Frames: Stainless Steel Mill Finish No. 2

D. Pit Liners:
   1. Stainless Steel Mill Finish No. 2

PART 3 - EXECUTION

3.1 EXAMINATION

A. Products must be installed on a flat and level substrate, not more than 1/8 inch in 10 feet out of plumb per ACI 302.

B. Examine substrates and floor conditions for compliance with requirements for location, size, recess depth and other conditions affecting installation of the Entrance Floor Grilles and frames.

C. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install frames to comply with the Manufacture's written instructions. Install frames level and tightly fitted together to prevent units from bowing, warping, moving or slipping**.**

B. Install Entrance Floor Grilles to comply with the Manufacturer's written instructions. Coordinate top of Entrance Floor Grille surface with doors that swing across the Entrance Floor Grilles to provide clearances under the door.

C. Use all of the lockdowns as provided by the Manufacturer. Ensure that all of the lockdown machine screws are tight, and the Entrance Floor Grilles are level, coplanar with the adjacent floor and obstruction free.

3.3 PROTECTION

A. After completing frame installations, provide temporary filler of plywood or fiberboard in entrance mat recesses and cover frames with protective flooring. Maintain protection until construction traffic has ended and project is near substantial completion.

B. Install Entrance Floor Grilles when no further wheeled construction traffic will occur and all wet type operations, including painting are complete.

3.4 MAINTENANCE

A. After installation, inspect the Entrances Floor Grilles regularly to ensure that all of the lockdown machine screws are tight, and the Entrance Floor Grilles are level, coplanar with the adjacent floor and obstruction free.

B. Maintain Entrance Grilles and frames to comply with the Manufacturer's written instructions.

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees, shrubs, groundcovers, plants and grass to remain.
2. Removing existing trees, shrubs, groundcovers, plants and grass to be removed.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities.
7. Temporary erosion and sedimentation control measures.

B. Related Sections include the following:
1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and temporary erosion and sedimentation control procedures.
2. Division 01 Section "Execution" for verifying utility locations and for recording field measurements.
3. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.
4. Division 32 Section 329200 "Turf and Grasses" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify “Julie” for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

E. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

H. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to a sediment and erosion control plan, specific to the site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within fenced area.
2. Do not permit vehicles, equipment, or foot traffic within fenced area.
3. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with burlap and water regularly.
2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
3. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
4. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

1. Employ an arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
2. Replace trees that cannot be repaired and restored to full-growth status, as determined by Architect.

3.4 UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

E. Removal of underground utilities is included in Division 22, Division 23, and Division 26, Sections covering site utilities.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
4. Use only hand methods for grubbing within tree protection zone.
5. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within tree protection zones.
3. Dispose of excess topsoil as specified for waste material disposal.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.8 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns and grasses and exterior plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Subbase and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling for utility trenches.
8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

B. Related Sections include the following:
1. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
2. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
3. Divisions 21, 22, 23, 26, 27, and 28 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
4. Division 31 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
5. Division 31 Section "Dewatering" for lowering and disposing of ground water during construction.
6. Division 31 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
7. Division 31 Section "Drilled Concrete Piers and Shafts" for excavation of shafts and disposal of surplus excavated material.

8. Division 32 Section "Turf and Grasses" for finish grading, including preparing and placing topsoil and planting soil for lawns.
9. Division 32 Section "Plants" for planting bed establishment and tree and shrub pit excavation and planting.
10. Division 33 Section "Subdrainage" for drainage of foundations, slabs-on-grade, walls and landscaped areas.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices. W-T recommends unit prices
2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. Insert volume for footing, trench, and pit excavation that cannot be

removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,090 lbf and stick-crowd force of not less than 18,650 lbf; measured according to SAE J-1179.
2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 48,510-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.

I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by an independent geotechnical testing agency, according to ASTM D 1586.

J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

L. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

M. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Each type of plastic warning tape.
2. Geotextile.
3. Controlled low-strength material, including design mixture.
4. Geofoam.

B. Samples: 12-by-12-inch Sample of subdrainage and separation geotextile.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 698 for each on-site and borrow soil material proposed for fill and backfill.

D. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by City and Architect and then only after arranging to provide temporary utility services according to requirements indicated.

1. Notify City and Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without City and Architect's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Liquid Limit: Per IDOT Specifications.

2. Plasticity Index: Per IDOT Specifications.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed , crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or

polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
4. Tear Strength: 56 lbf; ASTM D 4533.
5. Puncture Strength: 56 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.5per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 247 lbf; ASTM D 4632.
3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
4. Tear Strength: 90 lbf; ASTM D 4533.
5. Puncture Strength: 90 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Low-density, self-compacting, flowable concrete material as follows:

1. Portland Cement: ASTM C 150, Type II.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33, 3/4-inch nominal maximum aggregate size.
4. Foaming Agent: ASTM C 869.
5. Water: ASTM C 94/C 94M.
6. Air-Entraining Admixture: ASTM C 260.

B. Produce low-density, controlled low-strength material with the following physical properties:

1. As-Cast Unit Weight: 30 to 36 lb/cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
2. Compressive Strength: 80 psi, when tested according to ASTM C 495.

C. Produce conventional-weight, controlled low-strength material with 80-psi compressive strength when tested according to ASTM C 495.

2.4 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."

C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing," during earthwork operations.

D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. If rock is encountered remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

    a. 24 inches outside of concrete forms other than at footings.
    b. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Engineer. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.

    a. Intermittent drilling; if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

   a. 24 inches outside of concrete forms other than at footings.
   b. 6 inchesbeneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

   1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

   1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings,

and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3.8 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psiMPa), may be used when approved by Architect.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete".

D. Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches(100 mm) of concrete before backfilling or placing roadway subbase.

E. Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.

   1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the utility pipe or conduit.

G. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

H. Place and compact final backfill of satisfactory soil to final subgrade elevation.

I. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

J. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

   1. Under grass and planted areas, use satisfactory soil material.

2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Division 33 Section "Subdrainage."

B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.
2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

3.18 SUBBASE AND BASE COURSES

A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase and base course to required crown elevations and cross-slope grades.
4. Place subbase and base course 6 inches or less in compacted thickness in a single layer.
5. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
6. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.19 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.20 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.21 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: At discretion of Owner, remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

B. Disposal: At discretion of Owner, transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 312000

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Sections:

1. Division 01 Section "Construction Progress Documentation" recording preexisting conditions and excavation support and protection system progress
2. Division 01 Section "Temporary Facilities and Controls" for temporary utilities and support facilities.
3. Division 31 Section "Dewatering" for dewatering system for excavations.

1.3 PERFORMANCE REQUIREMENTS

A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.

1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified structural engineer, using performance requirements and design criteria indicated.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
4. Monitor vibrations, settlements, and movements.

1.4 SUBMITTALS

A. Shop Drawings: For excavation support and protection system.

B. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified structural engineer responsible for their preparation.

C. Coordinate first paragraph below with qualification requirements in Division 01 Section "Quality Requirements."Qualification Data: For qualified professional engineer.

D. Other Informational Submittals:

1. Photographs Show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems. Submit before Work begins.
2. Record Drawings: Identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions.

    a. Note locations and capping depth of wells and well points.

1.5 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:

    a. Geotechnical report.
    b. Existing utilities and subsurface conditions.
    c. Proposed excavations.
    d. Proposed equipment.
    e. Monitoring of excavation support and protection system.
    f. Working area location and stability.
    g. Coordination with waterproofing.
    h. Abandonment or removal of excavation support and protection system.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Architect, Construction Manager and Owner no fewer than two days in advance of proposed interruption of utility.

2. Do not proceed with interruption of utility without Construction Manager's written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from the data.

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.
2. The geotechnical report is included elsewhere in the Project Manual

C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

1. Corners: Roll-formed corner shape with continuous interlock.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application.

E. Shotcrete: Comply with Division 03 Section "Shotcrete" for shotcrete materials and mixes, reinforcement, and shotcrete application.

F. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

G. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

H. Tiebacks: Steel bars, ASTM A 722/A 722M.

I. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than

2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.3 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

3.5 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlaying construction and abandon remainder.
2. Fill voids immediately with approved backfill compacted to density specified in Division 31 Section "Earth Moving."
3. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

B. Leave excavation support and protection systems permanently in place.

END OF SECTION 315000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Hot-mix asphalt paving.

B. Related Sections:
   1. See also specifications on civil drawings.
   2. Division 31 Section “Earth Moving”
   3. Division 31 Section “Rough Grading”
   4. Division 32 Section “Concrete Paving”

1.3 DEFINITION

A. Surface Course – The surface / wearing course shall be installed uniformly, to all finished lines and grades, smooth, durable, skid-resistant, impervious thus protecting lower layers, and stable. Workmanship of the finished surface course shall be of the highest industry standards possible prior to acceptance by the Owner. The surface course shall be built with a maximum aggregate particle size of between ½” and ¾”. Surface course shall be a nominal 1-½” compacted thickness, unless otherwise shown on the scope of work, with no thickness less than 2-times the maximum aggregate particle size (MAS)

B. Leveling Course – The course and location of the parking area that requires placement of a variable thickness of HMA to ‘true up’ the lot prior to placement of the surface course. This course has a MAS no greater than that of the surface course.

C. Base Course – The lower courses of the pavement structure below the surface and leveling course with a MAS of between ¾” and 1”. Base courses shall not be allowed to remain without the surface course placed over an extended period of time and as approved by the engineer.

D. Tacking / Priming – The process of applying one coat of emulsified asphalt to all horizontal and vertical surfaces of either an existing pavement for an overlay or between lifts while building an improved or new structure (tacking), or upon the aggregate base (priming).

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
   1. Job-Mix Formulas (JMF): For each job mix proposed for the Work.

B. Samples: For each paving fabric, 12 by 12 inches minimum.

C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

E. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.

F. Data Logger Report: Submit data logger report from asphalt plant of actual asphalt mix used. Reports must be created for every 6 minutes of run time at the plant.

1.5 QUALITY ASSURANCE

A. Hot Mix Asphalt (HMA) shall be manufactured from a state approved / certified HMA manufacturing facility. Work consists of one or more courses of HMA constructed on a prepared foundation. The asphalt concrete consists of a mixture of uniformly graded aggregate and specified type and grade of asphalt binder. The manufacturing facility shall be capable of producing HMA in accordance with the following requirements and all applicable local agency specifications on an ongoing and consistent basis.

B. Ensuring uniform material is produced and selecting the vendor for these asphalt projects will require timely submittal of documents and qualifications to the satisfaction of the Owner. Contractor / material supplier shall demonstrate the existence of the following documents:

   1. Approved vendor certificate for the state where work is being done,
   2. Quality Control manual for material production over-site and testing measures being performed both at the asphalt plant as well as on the job site, and
   3. List / Organizational Chart showing personnel responsible for use of equipment and actions of the crew on the grade while paving and compacting asphalt.

C. Calibrated equipment and qualified personnel must be accessible at all times during the construction of this HMA. The Contractor shall provide the necessary equipment,

materials, and labor to complete the job acceptable to the Owner. Variations in the size and amount of equipment will depend on the size of the area being paved.

D. Thin lift nuclear gauge shall be used to verify installed asphalt compaction.

E. It is imperative that all documents list a 'Person-in-Charge' who is responsible for the over-site of the previously listed activities. This individual will be the point of contact for the Owner and they shall work with the Owner to ensure timely project completion and specification compliance. This individual shall be knowledgeable in all aspects of asphalt design, production, and installation and shall be an employee of the company holding the contract with the Owner, even if the HMA is being produced and supplied by a separate vendor.

F. Asphalt content and aggregate gradation plant testing shall be provided by the contractor.

PART 2 - MATERIALS

2.1 Tack Coat and Prime Coat: AASHTO M140 or M208 (Reference the Asphalt Institute MS-19 for Handling, Storage and Application criteria).

A. Tack Coat: SS-1, SS-1h, CSS-1 or CSS-1h diluted with an equal amount of water, or agency acceptable product.

B. Prime Coat: Prime Coat materials of MS-2, CMS-2, or HFMS-2s.

2.2 Hot Mix Asphalt:

A. Aggregates, mineral filler, and asphalt binder shall meet or exceed the requirements of local specifications for asphalt pavements placed under this contract for qualities and types. The coarse aggregate shall be sound, angular crushed stone, crushed gravel, or crushed slag. The fine aggregate shall be well graded, moderately sharp to sharp sands.

B. All HMA mix designs shall be performed in accordance with the Asphalt Institute MS-2 and SP-2, current edition. The HMA mix designs developed shall meet the requirements of one of the following for compactive effort:

1. Marshall, 50-Blow,
2. Superpave, 50-Gyration, or
3. Hveem, Low Volume Mix.
4. Alternate design with the Engineers approval prior to time of bidding.

C. HMA Mix Designs shall be performed by qualified personnel with proven past experience and successes in the mix design and quality control of asphalt production. Resumes of the signing 'individual-in-charge' may be required by the Owner and shall

be supplied if requested. The design shall meet the following requirements and be less than 24-months old. However the mix design method used shall be the Contractors option, as stated previously, based on various methods which currently exist around the nation. A completed design shall require submittal of documentation as detailed, requested by the Owner in order for the producer to demonstrate knowledge of design and production criterion.

D. Bidding documents shall include the Contractors proposed Asphalt Mixture Design sheets. (Ref. Mix Design Submittal Checklist sheet at the end of this document.) Designs will be for HMA to be placed for each of the uses anticipated on each project; patching, base, leveling, and / or surface course. Different asphalt suppliers shall require different design submittals.

E. All submitted HMA mix designs shall contain at a minimum the following information:

1. All Aggregate Gradations
2. Plot (0.45 power graph) of Final Aggregate Blend
3. Bulk Specific Gravity of All Aggregates and Final Blend (Gsb) including worksheets for natural as well as reclaimed asphalt pavement (RAP).
4. Optimum % Asphalt Binder (Pb)
5. Mix Air Voids at Optimum (Va)
6. Bulk Specific Gravity of Mix at Optimum (Gmb)
7. Theoretical Maximum Specific Gravity at Optimum (Gmm)
8. Voids in the Mineral Aggregate (VMA) and Voids Filled with Asphalt (VFA)
9. Dust to total AC Ratio
10. All Design Data and associated Design Curves

F. Mix Design Method Requirements

Measures	**Superpave**	**Marshall**	**Hveem**
Stability, lbs.	n/a	1,200 min.	30 min.
Flow, 0.01 in.	n/a	8 to 16	n/a
Swell, in.	n/a	n/a	0.030 max.
Air Voids @ optimum AC	3.5%	3.5%	3.5%
VMA (base mix)	13.0 min.	13.0 min.	13.0 min.
VMA (surface mix)	14.5 min.	14.5 min.	14.5 min.
VFA	70 to 80	70 to 80	70 to 80
Dust to total AC (design)	0.6 to 1.0	0.6 to 1.0	0.6 to 1.0
Dust to total AC (production)	0.8 to 1.2	0.8 to 1.2	0.8 to 1.2

G. In addition, all design methods and measures listed above shall meet the following criterion:

1. Base mixes shall have a minimum of 45% passing the #4 sieve,
2. Surface and leveling mixes shall have a minimum of 45% passing the #8 sieve,
3. Coarse Aggregate fraction shall have a minimum of 75% crushed faces,
4. Fine Aggregate Angularity (AASHTO T-304, Method A), shall be >= 40% with a maximum of 20% natural sand.
5. Mix Designs shall include a breakdown factor, increase to minus #200, introduced during the design stage to mimic production values,
6. VMA is based on the aggregate bulk (dry) specific gravity, Gsb, as determined by AASHTO T-84 and T-85,
7. Performance Graded binder shall meet typical agency specification for low to medium volume roadways,
8. Maximum of 30% RAP may be used in the HMA Binder and Surface Courses.
9. No iron pyrite nor slag will be allowed in the aggregate mix.
10. Current Quality Control testing of the mixture proposed to be used on the project shall be submitted to the Owner prior to acceptance of the proposed mix design.

H. Testing required to validate or control the mix supplied is the Contractor's responsibility and will be included in the bid cost for providing these HMA items. Daily maximum theoretical specific gravity values must be made available to the Contractors density technician for verifying in-place density within four hours of start of production. Asphalt content, gradation, and bulk specific gravity (Gmb) testing shall be done a minimum of once every 400 tons of HMA supplied or every third day for low tonnages that when added together successively do not equal 400 tons. Acceptable average measures are made by use of a correlated nuclear density gauge, Pavement Quality Indicator or PaveTracker (non-nuclear) or by cutting (4) cores per lift, per day and testing per AASHTO T-166, Method C. Additional testing shall be performed on any given day once 400 tons of asphalt is placed.

I. Any average in-place density measure for surface course mixtures that is less than required for the day will result in a reduction in HMA pay equal to the following chart. After reaching the 30% reduction mark the pavement shall be removed and replaced by the Contractor or left in place with no compensation due the Contractor. Base and leveling installation of asphalt shall meet local DOT specifications for in-place density measures. Surface course longitudinal joints shall be measured 6" from the joint, centered upon core or density gauge, and shall meet the mat density requirements minus 2.0% as a minimum. Base and leveling course longitudinal joint density measures shall achieve between 95% - 102% of maximum achievable individually, with an average of 98% on any given day.

J. In-Place Density Pay Schedule, Surface Course Mat Density

Pay Factors, % (percent)	In-Place Density, % Maximum Theoretical Specific Gravity, G_{mm}
100	> 92.0%
100 – 0.5 for each 0.1% below 92.0%	91.0% to 92.0%
95 – 1.0 for each 0.1% below 91.0%	90.0% to 91.0%
85 – 1.5 for each 0.1% below 90.0%	89.0% to 90.0%

K. Process Control testing shall be in accordance with state standards for frequency and methods where the work being performed is done with a minimum of testing meeting the above QC requirements.

PART 3 - EXECUTION

3.1 Pre-Paving Meeting

A. Contractor shall schedule a Pre-Paving Meeting at least one (1) month prior to anticipated start of paving construction.

B. Contractor shall provide a Paving Plan at the time of the Pre-Paving Meeting including the following information:

1. Required Tonnage of Asphalt material.
2. List of Equipment proposed for Asphalt installation.
3. Number of Trucks proposed for use during paving operations.
4. Proposed paving pattern with widths of proposed paving passes.
5. No Laydown Pads shall be used.

3.2 Equipment

A. Tack / Prime Coat Distributor Truck must have an insulated tank, heating system and a distributor capable of maintaining a uniform application of emulsified asphalt under pressure throughout the area to be paved. This requires a pump in good working order, full circulating spray bars, and free flowing nozzles. Small, isolated areas may be tacked with a wand.

B. Trucks shall have smooth, clean and tight metal beds that do not have mixture sticking to the truck bed and from which the entire quantity of HMA can be discharged smoothly into the spreading equipment. Trucks shall have a tarp and insulation as needed to protect the asphalt mixture from wind, rain and cold temperatures. Trucks for hauling asphalt mixture shall be in good, safe working condition.

C. Paving Equipment must be capable of placing, spreading and finishing courses of HMA to the specified thicknesses. HMA shall be free of marks, segregation and be

placed to the required uniform elevation with a smooth texture not showing tearing, shoving, or gouging. Auger extensions are required if segregation occurs while pavers are extended beyond the basic screed width. Paving Equipment shall be LeeBoy or ProPaver type or the equivalent. Hand work shall be minimized to ensure the best possible finished surface. Self-propelled pavers shall be used for paving operations. No tow behind pavers will be allowed.

D. Rollers shall conform to the manufacturer's specifications for all ballasting. At least one vibratory roller (minimum 6' wide) shall be required for each project. Rollers shall be of good condition and capable of compacting the HMA to the minimum in-place density required by this specification.

3.3 Pavement Preparation

A. Repair pavement failures and perform crack repair according to their respective specification requirements prior to HMA installation.

B. Cold-milling and/or grinding may be necessary to ensure that the asphalt edges at concrete abutments such as approaches, sidewalks, curbing, and drainage basins have smooth transitions.

C. After site review, detail whether wedge milling is necessary to assure positive drainage and transition. Install leveling course, if required, on the project per the site details and quantities shown on the plan sheets.

D. Existing surfaces to receive HMA must be clean prior to the installation of any portion of the work. Clean the surface on which the asphalt concrete is to be placed, and keep it free of accumulations of materials that would, in the judgment of the Owner, contaminate the mixture, prevent bonding, or interfere with spreading operations. Methods used may include but not be limited to the use of a sweeper that can wet and vacuum the area free of dirt and debris, clay, and dust, or any other foreign material.

E. Any oil or grease spots shall be scraped and treated to prevent bleeding through the tack coat. Bad oil spills may require removal with a wire brush or other suitable tool. Maintain clean pavements prior to applying emulsified tack coat. When approved sub-grade or pavement courses previously constructed under the Contract become loosened, rutted, or otherwise defective, the Contractor must correct the deficiency according to the contract item or items involved before the spreading of a subsequent pavement course.

F. Apply tack coat at the diluted rate of 0.10 gal / sy over newly constructed asphalt leveling or base mixes, 0.10 gal / sy over existing asphalt pavements and 0.15 gal / sy over milled surfaces. The higher rate shall be used on dry and brittle surfaces. All vertical edges abutting proposed asphalt surfaces shall receive a tack coat. Excessive asphalt applications, drooling, or pooling shall be swept with a broom to

ensure proper bonding of the HMA. Immediately install the HMA after the asphalt emulsion has 'broken'.

G. If shown on the plans, apply prime coat at the diluted rate of 0.35 gal / sy over newly placed aggregate base course prior to the installation of the base asphalt.

H. Install tack / prime coat during appropriate weather conditions and protect the tack / prime coat from traffic so as not to wear and track. Allow the tack / prime coat to 'break', i.e. turn from brown to black prior to installation of the HMA.

3.4 Pavement Placement

A. Surface course longitudinal joints shall run with the traffic pattern. Therefore, pulling across the driving lanes shall not be allowed unless express permission is given by the Owner. Detail and submit to the Owner a paving plan on the site plan sheet prior to placement of asphalt.

B. The entire roadway surface course shall be paved on the same day. The timing and process should be discussed with and approved by the Owner before proceeding with the work. Work in such a manner as to not unduly limit parking or access to the site by customers or employees. Maintain access to at least 50% of the roadway for residents during paving unless approved in advance.

C. Rolling shall start as soon as the HMA can be compacted without displacement. Rolling shall continue until the HMA is thoroughly compacted and all roller marks have disappeared. Compact the HMA to a minimum in-place density of 92.0% of the Theoretical Maximum Specific Gravity, Gmm.

D. Smoothness shall meet the requirements of no greater than ¼" in 10 ft. for base and leveling courses and 3/16" in 10 ft. for surface course.

E. Thickness of the overall mat shall be within ¼" of the specified plan thickness at all locations. However, the yield for the day and for the entire site shall meet calculated theoretical based on 92% of Gmm supplied from the Contractors mix design and daily test values.

F. Paving Joints
1. Minimize construction, longitudinal and transverse joints left open for an extended period of time.
2. Construct parking swale longitudinal joint by paving in a hot fashion with a temperature of not less than 220˚F to ensure maximum performance.
3. Compact all joints to provide for a neat, uniform and tightly bonded joint that will meet both surface tolerances and density requirements.

4. Cut true construction or transverse joints if the material has cooled to less than 220˚F prior to the placement of the next pass to ensure the best performing joint possible.

G. Completed HMA placement must be laid in order to allow positive drainage away from buildings and towards drainage outlets. Any ponding of water is not acceptable and shall require replacement at the Contractor's expense. Flood lot as directed by the Owner to determine positive drainage acceptability.

H. Protect the HMA until such time that traffic can be placed upon the properly compacted asphalt and show no signs of deformation.

I. If excessive segregation is occurring during placement operations, the Contractor will investigate the cause(s) and make appropriate changes to the satisfaction of the Owner.

3.5 Work Timeliness

A. HMA Full-depth pavements / Overlays (a/k/a Resurfacing): The repairs, HMA overlay, and striping shall be accomplished in such a manner as not to unduly limit access to the site by owners. There shall never be less than 50% of the usable roadway available unless work is approved by the owner. Every attempt should be made to complete the surface course placement process in one continuous placement with no cold joints. The timing and process should be discussed with the Owner before proceeding with the work.

3.6 Site Specific Identification, Contractor shall:

A. Remove and store bumper blocks and other accessories during operations, reinstall after work is completed, and replace any and all broken bumper blocks.

B. Remove all waste materials from the site and dispose of according to local ordinances.

C. Complete all work in compliance with ADA requirements.

D. Notify Owner when traffic can return to roadway.

E. Supply Owner with Notarized Certificate of Compliance for all products used on the project.

F. Supply Owner with yield calculations for all products used on the project. (for example, placement of 1,300 sq. yds. of Hot Mix Asphalt,1-¾" compacted thickness will require 128 tons when the unit weight = 150 pcf.)

References:

Asphalt Institute, Lexington, KY

National Asphalt Pavement Association, Lantham, MD

Mix Design Submittal Checklist

Project: _____ **Date:** _____

Supplier: _____ **Mix Design:** _____ Surface / Leveling / Base

Included	Missing	N/A	Required Information
			Contractor to select mix design method: (design shall be less than 24 months old)
			50-Blow Marshall
			50-Gyration Superpave
			Hveem, Low Volume
			Other, Engineers Approval Req'd Before Bidding
			Proper Authorizating Signature for Mix Design
			All Aggregate Types, Gradations & % Crush
			FAA >= 40%, Maximum of 20% Natural Sand
			Plot (0.45 Power Graph) of Final Aggregate Blend
			Bulk (Dry) Specific Gravity of All Aggregates and Final Blend (Gsb), **Include All Worksheets**
			Optimum Binder Content (Pb)
			Mix Voids at Optimum (Va)
			VMA at Optimum
			Bulk Specific Gravity of Mix at Optimum (Gmb)
			Theoretical Maximum Specific Gravity at Optimum (Gmm)
			Dust to Total AC Ratio
			All Design Data and Associated Design Curves
			Recent Quality Control Production Charts
			Other Information per Specifications

Comments: _____

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:

1. Driveways and roadways.
2. Parking lots.
3. Curbs and gutters.
4. Walkways.
5. Unit paver base.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" general building applications of concrete.
2. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
3. Division 32 Section "Decorative Concrete Paving" for surface-imprinted, stamped finished concrete pavement.
4. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Qualification Data: For manufacturer.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

F. Field quality-control test reports.

G. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

E. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Obtain Architect's approval of mockups before starting construction.
4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
5. Demolish and remove approved mockups from the site when directed by Architect.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete producer.
d. Concrete pavement subcontractor.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

C. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.

F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.

G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

H. Plain Steel Wire: ASTM A 82, galvanized.

I. Deformed-Steel Wire: ASTM A 496.

J. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

K. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain steel bars.

L. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

M. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

N. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

O. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

P. Zinc Repair Material: ASTM A 780.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type II, gray. Supplement with the following:

a. Fly Ash: ASTM C 618, Class C.

b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Class 4M coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inchnominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 FIBER REINFORCEMENT

A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.

1. Products:

a. Monofilament Fibers:

1) Axim Concrete Technologies; Fibrasol IIP.
2) Euclid Chemical Company (The); Fiberstrand 100.
3) FORTA Corporation; Forta Mono.
4) Grace, W. R. & Co.--Conn.; Grace MicroFiber.
5) Metalcrete Industries; Polystrand 1000.
6) SI Concrete Systems; Fibermix Stealth.

b. Fibrillated Fibers:

1) Axim Concrete Technologies; Fibrasol F.
2) FORTA Corporation; Forta.
3) Euclid Chemical Company (The); Fiberstrand F.
4) Grace, W. R. & Co.--Conn.; Grace Fibers.
5) SI Concrete Systems; Fibermesh.

2.6 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

1. Products:

a. Axim Concrete Technologies; Cimfilm.
b. Burke by Edeco; BurkeFilm.
c. ChemMasters; Spray-Film.
d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
e. Dayton Superior Corporation; Sure Film.
f. Euclid Chemical Company (The); Eucobar.
g. Kaufman Products, Inc.; Vapor Aid.
h. Lambert Corporation; Lambco Skin.
i. L&M Construction Chemicals, Inc.; E-Con.
j. MBT Protection and Repair, ChemRex Inc.; Confilm.
k. Meadows, W. R., Inc.; Sealtight Evapre.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
n. Sika Corporation, Inc.; SikaFilm.
o. Symons Corporation; Finishing Aid.
p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

1. Products:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. Burke by Edoko; Aqua Resin Cure.
c. ChemMasters; Safe-Cure Clear.
d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.

e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
f. Euclid Chemical Company (The); Kurez DR VOX.
g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; Aqua Kure-Clear.
i. L&M Construction Chemicals, Inc.; L&M Cure R.
j. Meadows, W. R., Inc.; 1100 Clear.
k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
l. Symons Corporation; Resi-Chem Clear.
m. Tamms Industries Inc.; Horncure WB 30.
n. Unitex; Hydro Cure 309.
o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

1. Products:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 WP WB.
b. Burke by Edoco; Resin Emulsion White.
c. ChemMasters; Safe-Cure 2000.
d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
e. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
f. Euclid Chemical Company (The); Kurez VOX White Pigmented.
g. Kaufman Products, Inc.; Thinfilm 450.
h. Lambert Corporation; Aqua Kure-White.
i. L&M Construction Chemicals, Inc.; L&M Cure R-2.
j. Meadows, W. R., Inc.; 1200-White.
k. Symons Corporation; Resi-Chem White.
l. Tamms Industries, Inc.; Horncure 200-W.
m. Unitex; Hydro White.
n. Vexcon Chemicals, Inc.; Certi-Vex Enviocure White 100.

2.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

1. Manufacturers:

a. Bayer Corporation.
b. ChemMasters.
c. Conspec Marketing & Manufacturing Co., Inc.

d. Davis Colors.
e. Elementis Pigments, Inc.
f. Hoover Color Corporation.
g. Lambert Corporation.
h. Scofield, L. M.Company.
i. Solomon Colors.

2. Color: Per City requirements.

C. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

D. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

E. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:

1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

F. Chemical Surface Retarder: Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.

1. Products:

a. Burke by Edeco; True Etch Surface Retarder.
b. ChemMasters; Exposee.
c. Conspec Marketing & Manufacturing Co., Inc.; Delay S.
d. Euclid Chemical Company (The); Surface Retarder S.
e. Kaufman Products, Inc.; Expose.
f. Metalcrete Industries; Surftard.
g. Nox-Crete Products Group, Kinsman Corporation; Crete-Nox TA.
h. Scofield, L. M. Company; Lithotex.
i. Sika Corporation, Inc.; Rugasol-S.
j. Vexcon Chemicals, Inc.; Certi-Vex Envioset.

G. Pigmented Mineral Dry-Shake Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.

1. Products:

    a. Conspec Marketing & Manufacturing Co., Inc.; Conshake 600 Colortone.
    b. Dayton Superior Corporation; Quartz Tuff.
    c. Euclid Chemical Company (The); Surflex.
    d. Lambert Corporation; Colorhard.
    e. L&M Construction Chemicals, Inc.; Quartz Plate FF.
    f. MBT Protection and Repair, ChemRex Inc.; Mastercron.
    g. Metalcrete Industries; Floor Quartz.
    h. Scofield, L. M. Company; Lithochrome Color Hardener.
    i. Symons Corporation; Hard Top.

2. Color: Per City requirements.

H. Rock Salt: shall not be used.

2.8 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type II or AASHTO M 248, Type F.

1. Color: White, Yellow & Blue (As indicated on drawings).

2.9 WHEEL STOPS

A. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.

1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

2.10 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 3500 psi.

2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inchmm).

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 4-1/2 percent plus or minus 1.5 percent for 1-1/2-inch nominal maximum aggregate size.
2. Air Content: 4-1/2 percent plus or minus 1.5 percent for 1-inch nominal maximum aggregate size.
3. Air Content: 5 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture, plasticizing admixture and retarding admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals. As follows:

1. Fly Ash or Pozzolan: 25 percent.
2. Ground Granulated Blast-Furnace Slag: 50 percent.
3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

G. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd..

H. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earth Moving."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
2. Provide tie bars at sides of pavement strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 3/8-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.

J. Screed pavement surfaces with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

N. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

O. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated

to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in pavement surfaces as follows:

1. Immediately after float finishing, spray-apply chemical surface retarder to pavement according to manufacturer's written instructions.
2. Cover pavement surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
3. Without dislodging aggregate, remove excess mortar by lightly brushing surface with a stiff, nylon-bristle broom.
4. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.

B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on pavement surface. Tamp aggregate into

plastic concrete, and float finish to entirely embed aggregate with mortar cover of 1/16 inch.

1. Spray-apply chemical surface retarder to pavement according to manufacturer's written instructions.
2. Cover pavement surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
3. Without dislodging aggregate, remove excess mortar by lightly brushing surface with a stiff, nylon-bristle broom.
4. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface according to manufacturer's written instructions and as follows:

1. Uniformly spread 40 lb/100 sq. ft. dampened slip-resistive aggregate over pavement surface in 2 applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over pavement surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
4. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

D. Rock-Salt Finish: After initial floating, uniformly spread 5 lb/100 sq. ft. rock salt over pavement surface.

1. Cover pavement surface with 1-mil- thick polyethylene sheet and remove sheet when concrete has hardened and 7-day curing period has elapsed.
2. Embed rock salt into plastic concrete, power float concrete, and trowel finish.
3. After 7-day curing period, saturate concrete with water and broom-sweep surface to dissolve remaining rock salt.

E. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to pavement surface according to manufacturer's written instructions and as follows:

1. Uniformly spread dry-shake hardener at a rate of 100 lb/100 sq. ft., unless greater amount is recommended by manufacturer to match pavement color required.
2. Uniformly distribute approximately two-thirds of dry-shake hardener over pavement surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second dry-shake hardener application, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed by power floating.
3. After final floating, apply a hand-trowel finish followed by a broom finish to concrete.
4. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.

3.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape

or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot--m-) long, unleveled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.11 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

1. Spread glass beads uniformly into wet pavement markings at a rate of 6 lb/gal..

3.12 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes drilled or cast into wheel stops at one-quarter to one-third points. Firmly bond each dowel to wheel stop and to pavement. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.14 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.
END OF SECTION 321313

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Expansion and contraction joints within cement concrete pavement.
2. Joints between cement concrete and asphalt pavement.

B. Related Sections include the following:

1. Division 07 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.
2. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
3. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch- wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

D. Qualification Data: For Installer.

E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing of current sealant products within a 36-month period preceding the commencement of the Work.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 for testing indicated, as documented according to ASTM E 548.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
3. When joint substrates are wet or covered with frost.
4. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 COLD-APPLIED JOINT SEALANTS

A. Multicomponent Jet-Fuel-Resistant Sealant for Concrete: Pourable, chemically curing elastomeric formulation complying with the following requirements for formulation and with ASTM C 920 for type, grade, class, and uses indicated:

1. Urethane Formulation: Type M; Grade P; Class 12-1/2; Uses T, M, and, as applicable to joint substrates indicated, O.

a. Products:

1) Pecora Corporation; Urexpan NR-300.

2. Coal-Tar-Modified Polymer Formulation: Type M; Grade P; Class 25; Uses T and, as applicable to joint substrates indicated, O.

a. Products:

1) Meadows, W. R., Inc.; Sealtight Gardox.

3. Bitumen-Modified Urethane Formulation: Type M; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.

a. Products:

1) Tremco Sealant/Waterproofing Division; Vulkem 202.

B. Single-Component Jet-Fuel-Resistant Urethane Sealant for Concrete: Single-component, pourable, coal-tar-modified, urethane formulation complying with ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.

1. Products:

a. Sonneborn, Div. of ChemRex, Inc.; Sonomeric 1.

C. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.

1. Products:

a. Crafco Inc.; RoadSaver Silicone.
b. Dow Corning Corporation; 888.

D. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

1. Products:

a. Crafco Inc.; RoadSaver Silicone SL.
b. Dow Corning Corporation; 890-SL.

E. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.

1. Products:

a. Meadows, W. R., Inc.; Sof-Seal.

2.4 HOT-APPLIED JOINT SEALANTS

A. Jet-Fuel-Resistant Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3569.

1. Products:

a. Crafco Inc.; Superseal 444/777.
b. Meadows, W. R., Inc.; Poly-Jet 3569.

B. Jet-Fuel-Resistant Sealant for Concrete and Tar Concrete: Single-component formulation complying with ASTM D 3581.

1. Products:

a. Crafco Inc.; Superseal 1614A.
b. Meadows, W. R., Inc.; Poly-Jet 1614.
c. Meadows, W. R., Inc.; Poly-Jet 3406.
d. Meadows, W. R., Inc.; Poly-Jet 3569.

C. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.

1. Products:

a. Crafco Inc.; Superseal 444/777.
b. Meadows, W. R., Inc.; Poly-Jet 3406.

D. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.

1. Products:

a. Koch Materials Company; Product No. 9005.
b. Koch Materials Company; Product No. 9030.
c. Meadows, W. R., Inc.; Sealtight Hi-Spec.

2.5 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.6 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of backer materials.
2. Do not stretch, twist, puncture, or tear backer materials.
3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 321373